Written according to the New Syllabus CBCS Semester system for B.A./B.Sc./B.Com. (General/Honours) course in Environmental Studies of Calcutta University, W.B. State Barasat University, Burdwan University, North Bengal University, Kalyani University and Vidyasagar University.

ENVIRONMENTAL STUDIES

MODEL FIELD & PROJECT WORK

[*For* Semester II New Syllabus B.A./B.Sc./B.Com. General & Honours Course]

CBCS (New Syllabus, Semester System

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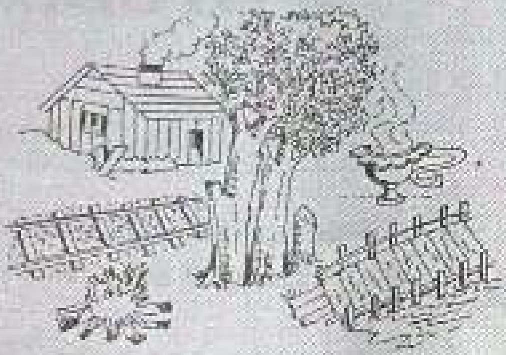

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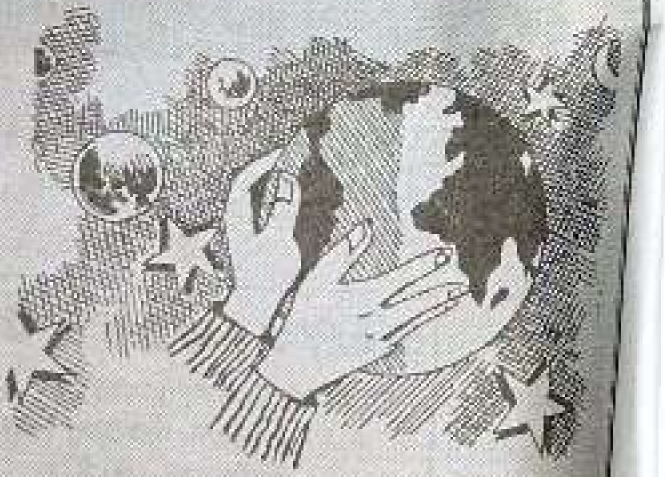

PREFACE

The author takes great pleasure in presenting the 9th edition & New Syllabus **CBCS Semester** System of this* book to the students and teachers of different colleges for their kind perusal.

Environmental Studies is an emerging branch of applied science. The study of environmental studies is very important for the sustainable development of a country. Students from all streams have to Study under Environmental Studies under New Syllabus **CBCS Semester** System for the students of B.A./B.Sc./ B.Com. system (General/Honours) course in Calcutta University, W.B. State Barasat University, Burdwan University, North Bengal University, Kalyani University and Vidyasagar University. As a Compulsory subject of their courses.

We hope that this book will be useful to the students of all streams of all universities of West Bengal.

Expecting suggestions from every quarters for the improvement of the book.

Haldia **Dr. Sujan Kr. Bala**

* New Edition 2019

UNIVERSITY OF CALCUTTA

Under Graduate Curriculum under Choice Based Credit System (CBCS)
Syllabus for Ability Enhancement Compulsory Course-2 (AECC-2) in
Environmental Studies

Semester-2

Total Marks-100 (*Credit-2*)

(50 Theory-MCQ type + 30 Project + 10 Internal Assessment + 10 Attendance)

[Marks obtained in this course will be taken to calculate SGPA & CGPA]

Theory

Unit 1 : Introduction to environmental studies — 2 lectures

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2 : Ecology and Ecosystems — 6 lectures

- Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession.
- Characteristic features of the following :
  (a) Forest ecosystem
  (b) Grassland ecosystem
  (c) Desert ecosystem
  (d) Aquatic ecosystems (ponds, streams, lakes, wetlands, rivers, oceans, estuaries)

Unit 3 : Natural Resources — 8 lectures

- Concept of Renewable and Non-renewable resources
- Land resources and landuse change; Land degradation, soil erosion and desertification.
- Deforestation: Causes, consequences and remedial measures
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Environmental impacts of energy generation, use of alternative and non-conventional energy sources, growing energy needs.

Unit 4 : Biodiversity and Conservation — 8 lectures

- Levels of biological diversity: genetic, species and ecosystem diversity;
- Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5 : Environmental Pollution 8 lectur

- Environmental pollution: concepts and types.
- Air, water, soil, noise and marine pollution— causes, effects and controls
- Concept of hazards waste and human health risks
- Solid waste management: Control measures of Municipal, biomedical and e-wast

Unit 6 : Environmental Policies and Practices 7 lectur

- Climate change, global warming, ozone layer depletion, acid rain and their impac on human communities and agriculture
- Environment Laws: Wildlife Protection Act; Forest Conservation Act; Water (Preventio and control of Pollution) Act; Air (Prevention & Control of Pollution) Act; Environme Protection Act; Biodiversity Act.
- International agreements: Montreal Protocol, Kyoto Protocol and climate negotiation Convention on Biological Diversity (CBD).
- Protected area network, tribal populations and rights, and human wildlife conflic in Indian context.

Unit 7 : Human Communities and the Environment 6 lecture

- Human population growth: Impacts on environment, human health and welfare
- Case studies on Resettlement and Rehabilitation.
- Environmental Disaster: Natural Disasters—floods, earthquake, cyclones, tsunam and landslides; Manmade Disaster, Bhopal and Chernobyl.
- Environmental movements : Bishnois, Chipko, Silent Valley, Big dam movement
- Environmental ethics : Role of gender and cultures in environmental conservation
- Environmental education and public awareness

Unit 8 : Project/Field Work Equal to 5 lectures

- Visit to an area to document environmental assets: Natural resources/flora/fauna, etc.
- Visit to a local polluted site— Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, fish, birds, mammals and basic principles of identification.
- Study of ecosystems— pond, river, wetland, forest, estuary and agro ecosystem.

Total 50 Lectures

Suggested Reading :

Asthana, D. K. (2006). *Textbook of Environmental Studies.* S. Chand Publishing.
Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India Basu, R. N., (Ed.) (2000). Environment. University of Calcutta, Kolkata
Bharucha, F. (2013). *Textbook of Environmental Studies for Undergraduate Courses.* Universities Press. De, A.K., (2006). *Environmental Chemistry,* 6th Edition, New Age International, New Delhi.
Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). *Environment Reader for Universities,* Centre for Science and Environment, New Delhi.
Masters, G. M. & Ela, W. P. (1991). *Introduction to environmental engineering and science.* Englewood Cliffs, NJ: Prentice Hall.
Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology.* Philadelphia: Saunders. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment Rastogi Publications.

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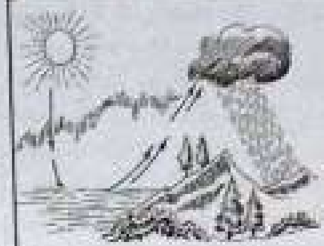

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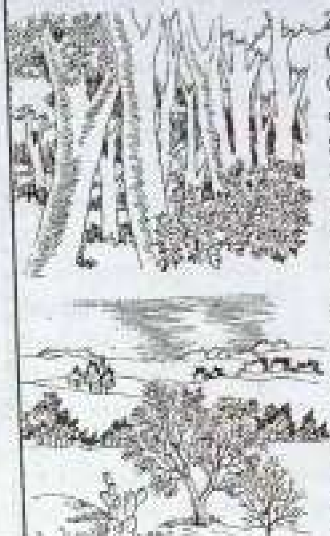

M.C.Q., Fill up the blanks, Very Short Answer type Questions, Short Type Question Answer, Read the following passages (small essays) carefully and darken the circle/circles corresponding to the correct statement of the respective passages.

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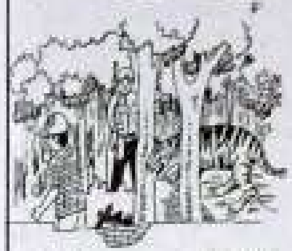

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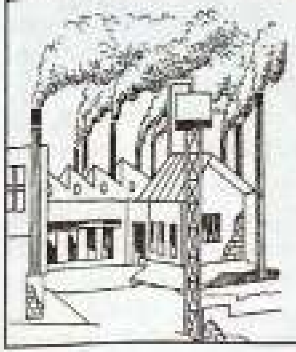
UNIT 5 ENVIRONMENTAL POLLUTION 97-148



5.1 Definition, 5.2 Classification of Pollution, On the basis of emission of Pollution, 5.3 Pollutant, 5.4 Types of Pollutant, Various Types of Pollution, 5.5 Air Pollution, Definition, Sources, Harmful effects , Source, Harmful Effects, Sources, Harmful effects, Source, Harmful effects, Harmful Effects , Effects of oxides of nitrogen on human health, Effects on Man, Effects on Vegetation, Control of Air Pollution, Control of Particulate Matters, 5.6 Water Pollution, Sources of Water Pollution, Effects of Water Pollution, control of surface water pollution, 5.7 Soil

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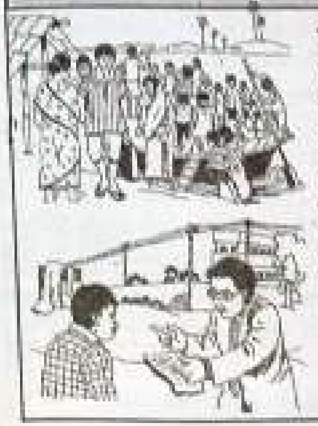
UNIT 7 HUMAN POPULATION AND THE ENVIRONMENT 191-233



7.1 Population Growth, 7.2 Growth of Population, 7.3 Concept of sustainable development, Variation among Nations, Demographic characteristics of developed and developing countries, Population Explosion, Highlight how population growth and natural resources are related? Population : Impacts on Environment, Environment and Human Population Pressure, Resettlement and Rehabilitation of people, Natura Disaster, Flood, Earthquake, Detection of earthquakes, Cyclone, Direction of wind in a cyclone, Landslides, Causes of Landslide, Effects of landslide/on Environment, Control of landslide, Case Study, Chernobyl disaster, Bhopal Gas Tragedy : A

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Case Study, Case Study, (i) Chipko Movement, (ii) Silen Valley Movement, Bishnoi Wildlife Protection, Appik Chavali Movement, Environmental Ethics, Role of Cultu and Gender in Environmental Conservation, A. Culture Sacred Forests and Lakes, B. Gender : Women and th environment, Gender and perception of the environmen Family Welfare Programme, Environment and Huma Health, Prevention and control of Air-borne diseases Water-borne Diseases, Prevention and Control of wate pollution related to illness, Human Rights, Women and Child Welfare, HIV (Human Immuno-deficiency Virus), Environmental Information System and Services, Environmental Information, Information System, Information Service, Environmental Information System in India, Internet, Nature Study and Need for Public Awarness, M.C.Q., Fill up the blanks, Very Short Answer type Questions, Short Type Question Answer, Read the following passages (small essays) carefully and darken the circle/circles corresponding to the correct statement of the respective passages.

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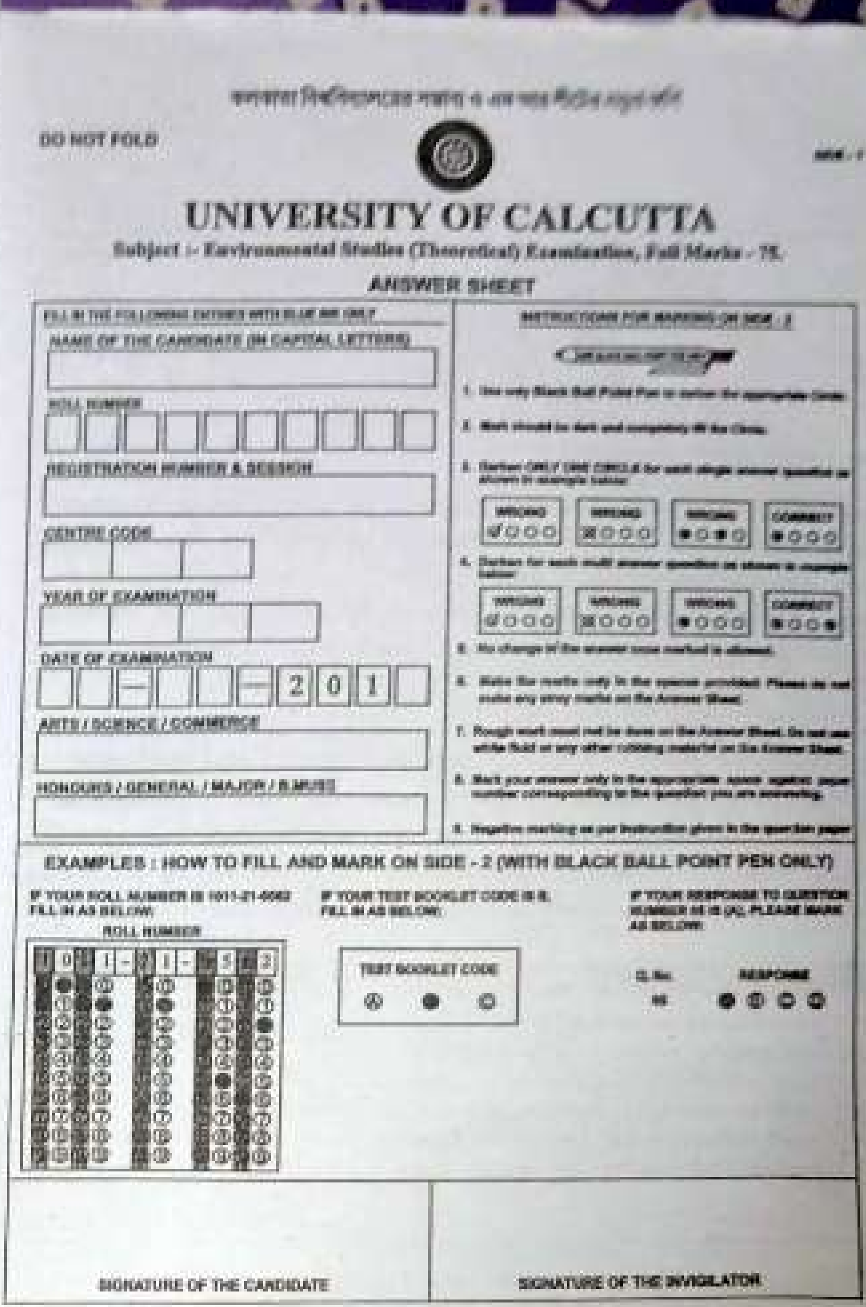
Calcutta University Question—2016—2019 253-



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UNIVERSITY OF CALCUTTA

Subject :- Environmental Studies (Theoretical) Examination, Full Marks - 75.

ANSWER SHEET

NAME OF THE CANDIDATE (IN CAPITAL LETTERS)

ROLL NUMBER

REGISTRATION NUMBER & SESSION

CENTRE CODE

YEAR OF EXAMINATION

DATE OF EXAMINATION

☐☐ — ☐☐ — 2 0 1 ☐

ARTS / SCIENCE / COMMERCE

HONOURS / GENERAL / MAJOR / B.MUS

EXAMPLES : HOW TO FILL AND MARK ON SIDE - 2 (WITH BLACK BALL POINT PEN ONLY)

TEST BOOKLET CODE

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SIGNATURE OF THE INVIGILATOR

SIDE - 2

Test Booklet Code

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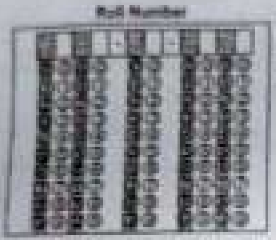

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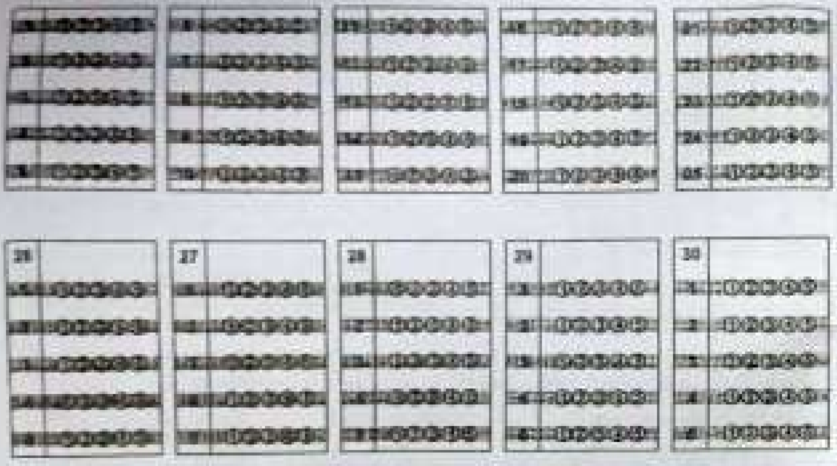


IMPORTANT INSTRUCTIONS

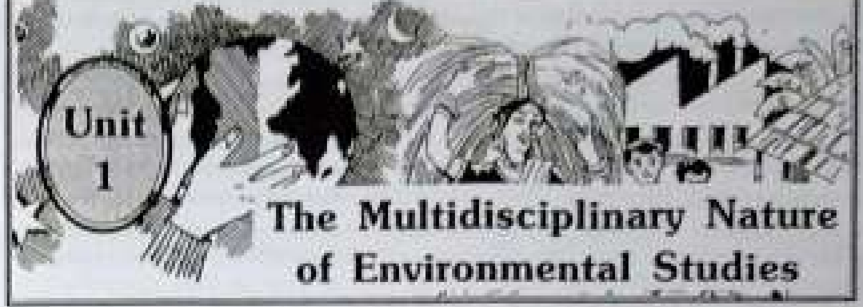
1. It is mandatory to use **Black Ball Point Pen** to darken the appropriate circle in the answer sheet.
2. Mark should be dark and should completely fill the circle.
3. Rough work must not be done on the answer sheet.
4. Do not use white-fluid or any other rubbing material on answer sheet.
5. Before handing over the answer sheet to the invigilator, candidate should check that Roll No and Order Code have been filled and marked correctly.

Some Important dates & occasions for irrespect of the Protection of Environment

- **12th January** → **National Youth Day**
- 18th February → Energy Day
- **26th January** → **Republic Day (India)**
- 28th February → National Science Day
- 8th March → International Women's Day; International Literacy Day
- **15th March** → **World Disabled Day**
- 21st March → World Forestry Day, International Day for the Elimination of Racial Discrimination
- 22nd March → World Day for Water
- 23rd March → World Meteorology Day
- 5th April → National Maritime Day
- 7th April → World Health Day
- **17th April** → **World Haemophilia Day**
- 18th April → World Heritage Day
- 22nd April → Earth Day
- 4th May → Coal Miners' Day
- **8th May** → **World Red Cross Day**
- **15th May** → **International Day of the Family**
- **31st May** → **Anti-tobacco Day**
- 3rd June → Sundarbans' Day
- **4th June** → **International Day of Innocent Children Victims of Aggression**
- 5th June → World Environment Day
- 16th June → Wetland Day
- **11th July** → **Population Day**
- **15th August** → **Indian Independence Day**
- **5th September** → **Teachers' Day**
- 8th September → World Literacy Day
- 16th September → World Ozone Day
- **22nd September** → **Walfare of Cancer Patients**
- 5th October → World Habitat Day
- 13th October → International Day for Natural Disaster Reduction
- **14th October** → **Children's Day**
- 16th October → World Food Day
- 1st November → Ecology Day
- 4th November → World Animal Welfare Day
- 10th December → Human Rights Day
- 29th December → International Biological Diversity Day
- 23rd December → Kishan Divas - Farmer's Day

MAB = Man and Biosphere.
W.T.O = World Trade Organisation
NEAC = National Environment Awareness Campaign,
NGC = National Green Corps.
NMNH = National Musium of Natural History
HIV = Human Immuno-Deficiency Virus.
AIDS = Acquired Immune Deficiency Syndrome
IRRI = International Rice Research Institute.
UNEP = United Nations Environment Programme/United Nations Economic Programm
UNESCO = United Nations Educational, Scientific and Cultural Organisation.
CITES = Convention on International Trade in endangered species.
IUCN = International Union for conservation of Nature and Natural resources.
WHO = World Health Organisation.
CNG = Compressed Natural Gas
W.W.F = World Wildlife Fund
I.T.C.F. = Inter Tropical Convergence Zone
CAZRI = Central Arid Zone Research Institute.
SPM = Suspended Particulate Matter
UNDP = United Nations Development Programme
NBA = Narmada Bachao Andolan
EPC = Environment Protection Council.
WCS = World Conservation Strategy.
NCS = National Conservation Strategy.
OECD = Organisation of Economic Co-operation and Development.

- **Which date is observed as World Human Rights Day?**
  10th December.
- **During which month a 'Vanamahotsava' is observed?**
  July.
- **Which date is the 'Energy Day'?**
  18th February.
- **Which date is observed as 'National Science Day'?**
  28th February.
- **Which date is observed as 'International Women' Day ?**
  8th March.
- **Which date is observed as 'World Meteorology Day'?**
  23rd March.
- ***Which date is observed as 'World Health Day'?***
  7th April.



Unit 1

The Multidisciplinary Nature of Environmental Studies

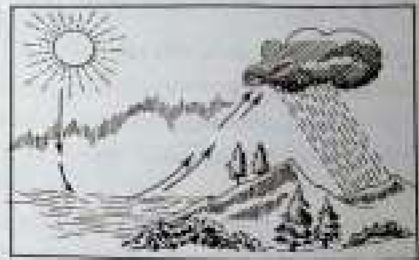
1.1 INTRODUCTION :

French word **'Environ'** means the surroundings and **'Ment'** means achieving. Environmental Studies deals with the study of Physical, Chemical & Biological conditions of surroundings and living organisms. According to McNaughton and Wolf, **(1979)** **'Environment'** denotes the sum total of physical and biological factors that directly influences the survival, growth, development and reproduction of organism.

1.2 DEFINITION :

'Environment' is the sum total of living and non-living things which exert influence on the living organisms present at a particular area.

'Environmental Studies' is the application of knowledge with many disciplines to the study and management of environment, which it deals with the analysis of the conditions and circumstances influencing life and how life in turn responds.

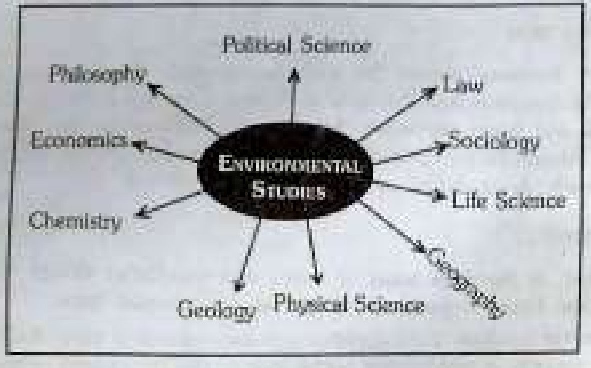


Earth originated approximately 5 billion years back and about 3·5 billion (350 crores) years ago, traces of living organism were reported in the hydrosphere. At present there are about 1·4 crores of species that are present in the world, out of which only 17·5 lakhs have been identified. The earliest continent was Pangaea. Earth is a planet. The lower layer of atmosphere of the earth is troposphere, the part of atmosphere where temperature increases with increasing altitude is collectively stratosphere and thermosphere and the region where life is found in earth is called biosphere. The land region of the earth is known as lithosphere, which accommodates plants, organisms and animals. The water body of the earth is hydrosphere. The total mass of atmosphere is approximately $5{\cdot}2 \times 10^{\text{[illegible]}}$ tonnes. The earth day is celebrated on 22nd April and 5th June is observed as World Environment Day. It is to be noted that the zone layer of atmosphere that contains the Ozone layer is called stratosphere. The average temperature of earth is about 15°C.

✗1.3 SCOPE :

Environmental Studies is a multidisciplinary subject. It has both theoretical and applied sides. This subject is related with Geography, Life Science, Chemistry, Physical Science, Geology, Sociology, Economics, Philosophy, Political Science and Law.

The theoretical side deals with the activities of human beings and the effects on environment. On the other hand the applied side deals with the solution of the environmental problems.



✗1.4 TYPES OF ENVIRONMENT :

Environments are of two types :

(i) Natural Environment.

(ii) Social Environment (including economic & cultural Environment).

(i) **'Natural Environment'** refers to all the biotic and abiotic elements of the world, i.e., water, air, soil, light, flora, fauna, and the related things. Two main components of it are—

(a) Biotic components, and (b) Abiotic components.

(a) Biotic components—Biotic components or the living components of environment include microbes, plants, animals and human beings. All of them together denote biodiversity of environment.

(b) Abiotic components—Abiotic components or the non-living components include the flow of energy necessary to maintain any organism and the physical factors that affect it and the supply of molecules required for its life functions. Other physical factors include climate, temperature, rain, snow, soil, hail, and seasonable distribution, of soil (sandy or clayey, dry or wet, fertile or infertile etc.)

The earth itself, in course of evolution, has created the natural environment. With the passage of time it is changing and will continue to change as long as the world remains.

(ii) Social Environment : *Social Environment is by and large man-made environment. It includes man's behaviour, economic policies, politics, education and ethical manners. The social environment is comparatively younger and always changeable with the behaviour, philosophy, ethical manners and the life of man.*

✗1.5 IMPORTANCE :

Environment plays an important role for making life. In fact, life is solely and wholly dependent on environment. The plants and animals together with man need oxygen of the air for respiration and minerals of soil to prepare protein and other essential organic compounds or Components. The process of photosynthesis by green plants requires sunlight, water and CO_2 from air to produce sugar and oxygen. The temperature is a very essential pre-requisite for the habitats of earth or the plants and animals.

These environmental components are changeable together with man due to the action of man and natural hazards. Under such circumstances living organisms face many acute problems and some of them get perished and become completely eliminated. Naturally, the balance of nature is disturbed to a great extent. Therefore 'environment' plays an important role for our life. But from the very dawn of civilization, up to modern day life, man did not bother about the physical and biological changes of the environment. Man has now realised that for the survival, of man the protection of the environment is extremely important. The atmosphere the biosphere together with all other related matters should be protected or saved from further disintegration or extinction.

✗1.6 FROM UNSUSTAINABLE TO SUSTAINABLE DEVELOPMENT

Kautilya said, "stability of an empire depends on the stability of its environment". He emphasized the concept of sustainable development. Recently Agenda-21 emphasized the same concept. A healthy relation of water, nutrients and the biogenic cycle and the energy-flows on land, in oceans and in the atmosphere, is important for evolving sustainable developmental strategies.

Man is not happy with the present socio-economic development. Water, air, land have been polluted due to the products and effluences of agriculture and industries. Forest reserves are getting smaller and smaller day by day. Greenhouse effect and the ozone hole are increasing. These are all possible obstacles to the development.

Many countries of the world are facing social, economic and environmental crisis today. Uncontrolled economic activities can directly undermine the potential for development by over-exploiting natural resources and reducing the carrying capacity of the natural ecosystems. The past civilizations, were not able to cope with the pressures of the degraded environment.

Sustainable Development :

Sustainable development is a new topic. From the very dawn of civilisation men have been improving themselves slowly and steadily by virtue of their empirical experiences.

Production and extravagance for enjoyment of life have begun but they have no uniform development. Proper understanding and co-existence should be the basic concept of sustainable development. "The sustainable development generally means that the present generation should satisfy or meet up their demands without hindering the economic progress which is necessary for the next generation."

Long-term sustainable development should be planned meticulously to cope up with the state of present environment. The main goal of the topic should be to improve the socio-economic status of man by wiping out famine and unemployment and by introducing education and health schemes for all. For launching any developmental projects environment must not be disturbed under any circumstances. In 1980, an exhaustive report on world conservation strategy was published by IUCN in which 'sustainable development' was emphasized and in 1992 in Basundhara Conference (Reo-de-Janeiro, Brazil) 'Agenda-21' was adopted for sustainable development of the world.

Mahatma Gandhi referred to a satisfactory society, by saying, "earth can provide for all the needs of humans, but not for their greeds." The terms 'sustainable development' is a confused and sometimes contradictory idea and there is no widespread agreement as to how it should be worked in practice (Doves and Handmer, 1993). A document called the **World Conservation Strategy** (IUCN/UNEP/WWF, 1980), which was developed in the international forum, argued that three priorities should be incorporated into all development programmes :

(i) Maintenance of ecological process,
(ii) Sustainable use of resources,
(iii) Maintenance of genetic diversity.

Sustainable development became popular after the World Commission of Environment and Development or Braundtland Commission which was formed by the UN in 1983 and reported in 1987 (**WCED**, 1987). The World Commission emphasized that the integration of economic and ecological systems is extremely important if sustainable development is to be achieved, and coined a broad definition of sustainable development, "development which meets the needs of the present without compromising the ability of future generations to meet their own needs (**WCED, 1987**)." Subsequently, similar calls for sustainable development have been made by various international groupings (*e.g.*, **IUCN/UNEP/WWF** 1991), at the UN Conference on Environment and Development (**UNCED**), which *was known as the Earth Summit,* in Rio-de-Janeiro in 1992.

M.C.Q.

1. **The earliest continent was :**
(a) Gondwanaland ☐ (b) Pangaea ☐ (c) Laurasia ☐

2. **The lowest layer of the atmosphere is :**
(a) Ionosphere ☐ (b) Troposphere ☐ (c) Stratosphere ☐

3. **Earth originated approximately**
(a) 10 billion years back ☐ (b) 5 billion years back ☐ (c) 2 billion years back ☐

4. **Water of the oceans comprises :**
(a) 63 per cent of the total water of earth ☐
(b) 73 per cent of the total water of earth ☐
(c) 93 per cent of the total water of earth ☐

5. **The earliest traces of life on earth have been found about**
(a) 2·5 billion years ago ☐ (b) 3·5 billion years ago ☐
(c) 4·5 billion years ago ☐

6. **The region where life is found on earth is called**
(a) Atmosphere ☐ (b) Hydrosphere ☐ (c) Biosphere ☐

7. **Biosphere is made of**
(a) Atmosphere ☐ (b) Lithosphere ☐
(c) Hydrosphere ☐ (d) All of them ☐

8. **Biosphere which accommodates plants and organisms consists of earth's?**
(a) Lithosphere ☐ (b) Hydrosphere ☐ (c) Atmosphere ☐

9. **The part of atmosphere where temperature increases with increasing altitude is**
(a) Stratosphere and Thermosphere ☐ (b) Troposphere ☐ (c) Mesosphere ☐

10. **What is the name of the super continent which broke into the present day continents?**
(a) Pampas ☐ (b) Palaearctic ☐ (c) Pangaea ☐

11. **World environment day is celebrated on**
(a) 5th September ☐ (b) 5th November ☐ (c) 5th June ☐

12. **Much of the atmospheric air is present in the**
(a) Stratosphere ☐ (b) Mesosphere ☐ (c) Troposphere ☐

13. **22nd April is celebrated as**
(a) Earth Day ☐ (b) Biodiversity Day ☐ (c) Wetland Day ☐

14. **The net amount of solar energy on the earth's surface is about :**
(a) 0·9 kw/m² (0·9 kilowatt per square meter) ☐
(b) 0·8 kw/m² (0·8 kilowatt per square meter) ☐
(c) 0·7 kw/m² (0·7 kilowatt per square meter) ☐

15. **Hydrosphere on the globe covers nearly :**
(a) 351,059,200 sq.km. ☐ (b) 361,059,200 sq. km. ☐
(c) 164,060,200 sq. km. ☐

16. **The total mass of the atmosphere is approximately :**
(a) $6{\cdot}2\times10^{2}$ tonnes ☐ (b) $6{\cdot}2\times10^{12}$ tonnes ☐ (c) $5{\cdot}2\times10^{15}$ tonnes ☐

17. **The mean temperature of Earth is approximately**
(a) 10°C ☐ (b) 15°C ☐ (c) 20°C ☐

18. **Earth is a**
(a) Planet ☐ (b) Galaxy ☐ (c) Star ☐

19. **Ozone layer is found in**
(a) Troposphere ☐ (b) Stratosphere ☐ (c) Ionosphere ☐

20. **Which of the following layers of the atmosphere has the lowest temperature?**
(a) Mesosphere ☐ (b) Troposphere ☐ (c) Stratosphere ☐

21. **Lithosphere means**
(a) Layer of gases ☐ (b) Layer of sands ☐ (c) Layer of gravels

22. **No. of species present on the earth is about**
(a) 1·4 crores ☐ (b) 1·7 crores ☐ (c) 2·7 crores ☐

23. **No. of species which have been identified are**
(a) 19·5 Lakhs ☐ (b) 17·5 Lakhs ☐ (c) 18·5 Lakhs ☐

ANSWER

1.(b) Pangaea, 2.(b) Troposphere, 3.(b) 5 billion years back, 4.(b) 73 per cent of the total water of earth, 5.(b) 3.5 billion years ago, 6.(c) Biosphere, 7.(d) All of them, 8.(a) Lithosphere, 9.(a) Stratosphere and Thermosphere, 10.(c) Pangaea, 11.(c) 5th June, 12.(c) Troposphere, 13.(a) Earth Day, 14.(a) 0·9 kw/m² (0·9 kilowatt per square meter), 15.(b) 361,059,200 sq. km., 16.(c) $5{\cdot}2\times10^{15}$ tonnes, 17.(b) 15°C, 18.(a) Planet, 19.(b) Stratosphere, 20.(b) Troposphere, 21.(c) Layer of gravels, 22.(a) 1·4 crores, 23.(b) 17·5 Lakhs.

Fill up the blanks :

Q.1. Atmosphere——and —— are together called Ecosphere.
Ans. Lithospere, Hydrosphere.

Q.2. The temperate forest lies between——and——latitudes in both the hemispheres.
Ans. 30°, 50°.

Q.3. Of the gaseous elements present in the atmosphere, the amount of — is the highest.
Ans. Nitrogen.

Q.4. The earlier Continent was——.
Ans. Gondwaland.

Q.5. The Solid part of the earth in called as——.
Ans. Lithosphere.

Q.6. The amount of Nitrogen in air is——%.
Ans. 77.17.

Q.7. The amount of oxygen in air is——%.
Ans. 20.60.

Q.8. The amount of Co$_2$ in air is——%.
Ans. 0.03.

Q.9. The three components of physical environment are lithosphere, hydrosphere and ——.
Ans. atmosphere.

Q.10 Physical environment is the result of interactions among land, air and ——.
Ans. water.

Q.11 Granite and slate are——and——rock type.
Ans. Igneous, Metamorphic.

Q.12. UNESCO stands for——.
Ans. United Nations Educational Scientific and Cultural Organisation.

Q.13. The theory that the natural condition governs man's behaviour is called ——.
Ans. Acarmann theory.

Q.14. The temperature at the core of the Earth is——degree centigrade and the average surface temperature is——centigrade.
Ans. 5000,15.

Q.15. The full from of IUCN is
Ans. International Union for Conservation of Nature and Natural Resources.

Q.16. Nature takes about——to——year to make 1 (one inch) of soil from rock weathering.
Ans. 1000,1500.

Q.17. Life on the earth surface have originated during——era while hum came during—— era.

Ans. Archean, cenozoic.

Q.18. While Oceans cover about——percent of the Earth's surface, forest co only —— per cent.

Ans. 71,33.

Q.19. The full form of UNEP is ——.

Ans. United Nations Environment Programme.

Q.20. The definition of Biogeochemical cycle is the movement of the essenti elements like C, H, O, N, P, S, Ca etc in between——and——.

Ans. environment, organisms.

Q.21. Normal proportion of forest area of a country should be ——.

Ans. 1 : 3 (33%)

Q.22. —— June is known as the World Environment Day.

Ans. 5th.

Q.23. UNEP stands for ——.

Ans. United Nations Environment Programme

Q.24. Sustainable development is —— from economic development.

Ans. more desirable.

Q.25. Full name of CBD is ——.

Ans. Central Business District.

Q.26. —— is the only habitat of living beings.

Ans. Earth

Very Short Answer type Questions

Q.1. What is SIAL?

Ans. The outer layer of the earth (Lithosphere) comprises two parts. The upper part i known as SIAL which Contists of **granitic** rocks and forms the Continents. Its main constituents are silica and alumina.

Q.2. What is SIMA?

Ans. Lower part of the lithosphere is known as SIMA. Its main constituents are silica, magnesium and iron. It is a continuous zone of denser **basaltic** rocks forming the ocean floors.

Short Type Question Answer

Q.1. Define atmosphere?

Ans. The Air surrounds the earth and extends as far as 1600 kms above the surface is called atmosphere.

Q.2. Mention the function of ozone layer of the statosphere.

Ans. The stratosphere from 20 km to 50 km height from earth surface, of the atmosphere. Inspite of law density ozone layer plays a very important role in our life, ozone layer absorbs the harmful part of the sunlight, the ultraviolet rays and infrared rays, and Protects the life on earth from harmful effects of these rays.

Q.3. Define biogeochemical cycle.

Ans. A cyclic transformation of certain essential chemical elements (nitrogen, oxygen, carbon-dioxide, sulphur. Phosphorus etc.) as they pass from the environment through the living components of the ecosystem and are eventually returned back to the environment.

Q.4. Explain Why nature conservation is necessary?

Ans. Plants, animals, air. soil, water, tempature and light are the basic and essential elements of environment. The life is solely and wholly dependant on environment. The process of photosynthesis requires sunlight, water and cor to make food (glucose) in green plants, other living organisms (animals including man) depend upon plants for food and energy. Oxygen is needed for respiration of the animals. Various natural resources are important for human civilization. These essential components of environment are to a great extent changable by the action of man and natural hazards. Naturally, the balance of nature is disturbed to a great extent. Under such circumstances, man, animals and plants face many acute problems. To avoid these problems conservation of nature is necessary.

Q.5. Define Environment

Ans. Environment denotes the sum total of physical and Biological factors that directly influence the survival, growth, development and reproduction of organism. (Mc Naughton and woll, 1979).

Q.6. What are the principal gases of the atmosphere

Ans. Nitrogen (78·089%), oxygen (20·60%) Co_2 (0·03%), other minor gases are methene Hilium etc. Nitrogen is necessary for formation of protoplasm of cell. Oxygen is necessary for respiration and Co_2 for photosynthesis.

Q.7. What is Sanctuary or wild life Sanctuary, Reserve forest and National Park ?

Ans. The forest area where killing and capturing of any species of animal or bird is prohibited and whose boundary should be sacroscant as far as possible except under the order of the competent authority is regarded as **sanctuary.**

Exp. Sundarban. Jaldapara (W. B.)

The Reserve forest is an area under the control of state govt. Where killing of any species and entrance of general people is strictly prohibited except research work under proper permission of the competent authority Exp. Garumara, chapramari (W. B.).

The National park is a large forest area under the control of Central Govt. Where catching of fishes, cutting of trees, killing of any species of animals and entrance inside the area without proper permission is strictly prohibited.

Exp. Hajaribagh (Jharkhand) Kanha (M.P).

Q.8. Define sustainable development.

Ans. A development is a sustainable development only when its advantage will not abruptly but will continue to be of benifit to many generations. "Sustainable develop meets the needs of the present without compromising the ability of future generations to their own needs"—Burtland commission.

Q.9. What is Urbasnisation?

Ans. 'Urbanisation' is a demographic process leading to a change in society, by movement of the people from rural to Urban areas (for better living standard, socioecono status etc.) have become increasingly densely populated, with towns become closely link from Urban zones and Conurbations.

Q.10. State the different levels of carrying capacity.

Ans. There are three levels of carrying capacity i,e low level, intermidiate level and hi level of carrying capacity. In the first stage when the carrying capacity is high the growth of population is slow but steady and this is called 'Positive condition', In the intermedi staige the population growth rate is high (Logarylhmic condition), In the last stage the carryi capacity is low and the growth of population is stable.

Q.11. What is Gondwanal and ?

Ans. 'Gondwanaland' is a landmass of the continent formed due to continental drift and breaking of the super continent pangaea.

Q.12. What is Biosphere ?

Ans. The region of the earth where life is found is called the earth's biosphere. All th earth's living components (plants and animals) live on the earth surface or close to the surfac (under ground, under water, atmosphere).

Q.13. What is IUCN ?

Ans. IUCN = International Union for Conservation of Nature and natural resources, I was established in 1948. It's main area of work is to conserve the nature. W.W.F is a siste concern of it.

Q.14. What is environmentalism?

Ans. It is a idealogical stand concerned with the protection of environment i.e., the manner in which a group of people regards its environment. The movement which was initiated by R. carson in 1962 to aware the public to the threats of pollution and toxic chemicals is called environmentalism.

Q.15. Define hydrosphere and lithosphere ?

Ans. Hydrosphere refers to all bodies of water ice, water vapour in the atmosphere i. e, the water on earth that exists on and in the ground and the atmosphere.

The outer layer of earth (The earth's crust) comprises granitic rocks (Forms the continents) and basaltic rocks (forms the ocean floors) is known as Lithosphere.

Q.16. How does culture influence our environment?

Ans. Biological information or heredity of a man is transmitted through genes like other animals but his culture is not carried on by genes but aquired a new by each from his surroundings or environment. Cultural evolution is more rapid than biological evolution. Gene stimulate development of culture and culture improvements chang the environment of an individual.

Read the following passages (small essays) carefully and darken the circle/circles corresponding to the correct statement of the respective passages.

Environmental studies is a multi-disciplinary subject, it is related to geography, geology, physics, chemistry, biology, history, economics, politics, law and sociology.

Environmental study is the trigger for environmental literacy. The goal of environmental education is to enlighten the public about the environmental challenges that we face today. The need for environmental studies can be summarised as follows :

(i) To create an awareness among the masses about the importance of proper utilization and conservation of the resources.

(ii) To provide every person with the opportunities to acquire the knowledge, values, skills, attitude and commitment to protect, improve and conserve the environment.

(iii) To examine major environmental issues in national and international level and to create new patterns of behaviour of individuals and communities as a whole towards environment.

Statement 1 : Environmental studies is a multi-disciplinary subject and the trigger for environmental literacy.

Statement 2 : Environmental study is necessary to create an awareness among the people about the conservation of the natural resources.

Statement 3 : Environmental studies is related to geography and biology but not related to history and politics.

Ans. ● ● ○
1 2 3

The three major objectives of environmental studies are enumerated below :

It makes people aware of nature, imparts knowledge of philosophy, genesis and consequences of environmental problems. It also helps in sustainable development and economic development.

Knowledge of environmental studies is necessary for conservation of life and biodiversity on our earth.

Environmental studies helps us to understand the adverse effects of any environmental problems and to cope with these problems.

Statement 1 : Environmental studies makes people aware about Nutrition and Sanskrit.

Statement 2 : Knowledge of Environmental studies is necessary for biodivers

Statement 3 : Environmental studies helps us to cope with Environmen Problems.

Ans. ○ ● ●
1 2 3

The word 'environment' is derived from the French word 'environ' which means surround'.

Environment is the circumstances or objects by which one is sorrounded. "It includ air, soil, climate, food supply and various external conditions. The environment al includes the things created by humans."

The environment has two components : (i) biotic and (ii) abiotic

Biotic component includes all living beings, e.g. animals, plants, human beings.

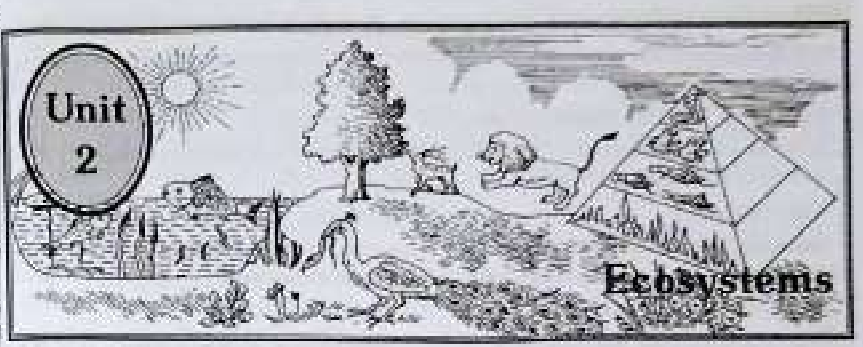
Abiotic component includes all non-living entities, e.g. water, sun, soil, air, etc

Statement 1 : Environment includes air, soil, climate etc.

Statement 2 : Biotic components include animals and plants.

Statement 3 : Abiotic compounds are man and plants.

Ans. ● ● ○
1 2 3



Unit 2

Ecosystems

2.1 INTRODUCTION :

The term ecosystem was introduced by Tansley (1935). The ecosystem represents the basic functional unit of ecology which comprises the biotic and abiotic components.

2.2 A BIOTIC COMMUNITY AND ITS ABIOTIC COMPONENTS TOGETHER CONSTITUTE AN ECOSYSTEM

Definition according to Odum :

The basic fundamental unit of ecology which includes both the organisms and non-living environment each influencing the properties of other and each is necessary for the maintenance of life.

2.3 ABIOTIC COMPONENTS :

Abiotic components are soil, water, air, bodies of other organisms. The inorganic components are minerals, water etc. and the organic components are excretary materials and decomposed dead bodies.

2.4 BIOTIC COMPONENTS :

Biotic compobents of an ecosystem includes all the living organisms. According to mode of nutrition the biotic components can be classified as different trophic levels such as :

(a) Producers : They are capable of producting their own food and entrapp solar energy by the process of photosynthesis. They are mainly green plants.

(b) Consumers : They are not able to prepare their own food as there is no chlorophyll in their body and they have to depend for their food and energy on green plants directly or indirectly. They can be classified as :

(i) Primary consumers : They depend on green plants directly for their Nutrition and energy. They are generally called herbivores.

Exp. Grass-hopper.

(ii) Secondary consumers : The consumers who depend on primary consumers for their nutrition and energy are known as secondary consumers.

Exp. Frog. They are known as carnivores.

(iii) Tertiary consumers : The animals who depend on secondary consumers for their food and energy are known as tertiary consumers.

Exp. Snake.

Generally, in a food-chain the tertiary consumer is the highest consumer but, in some cases an extra consumer is present who is the highest consumer.

Exp. Tiger, Lion, Eagle.

The energy flow is Unidirectional from the producer to the tertiary consumer level and follows 10% Law.

(iv) Decomposers : They are heterotrophs like consumers depending upon organic matter for the food. They utilize and decompose the organic matter for their energy and release inorganic substances for recycling. Eg. bacteria, fungi, protozoa, etc. The decomposers are micro-consumers.

Function of decomposers in an ecosystem.

Fungi and bacteria are the decomposers. They attack the dead remains of producers and consumers and degrade or disintigrate the complex organic components into simpler compounds. Some of them (transformers) are capable to reduce simple compounds to further simpler forms and return these back to the environment.

Grassland Ecosystems :

(i) Steppes of Asia;

(ii) Velds of South Africa;

(iii) Prairies of North America;

(iv) Pampas of South America.

Some important terms related to ecosystem :

Benthos : Living organisms attached or living in the bottom sediments of water bodies are known as "benthos".

Exp. Snail.

Nekton : Living organisms floating or swimming in the middle layer of water bodies are known as Nekton.

Exp. Prawn.

Ecocline : When two different types of Ecosystems get mixed at a region i.e., the transition area of two different types of ecosystems is called Ecocline.

Exp. Transition zone between forest ecosystem and wetland ecosystem.

Ecotone : Trasnsition zone between two diverse communities is called Ecotone.

Exp. The tundra-boreal forest Ecotone.

Ecotype : A subspecies or race that is especially adapted to a particular environmental conditions is known as ecotype.

Ecological niche : 'Ecological niche' refers to the habitat, role and position of a species within a community or an ecosystem which includes all physical, chemical and biological conditions, a species need to live and reproduce.

Biosphere, the unit of ecosystem :

The region of the earth where life is found is called the earth's biosphere. All the earth's living components (plants and animals) live on the earth surface or close to the surface (under ground, under water, atmosphere).

Ecocity : 'Ecocity' is a hypothetical term refering to a man-made city or 'no waste' city where all the characteristics of an ecosystem are found. The city would convert its garbage, wastes and pollutant into harmless and useful substances for irrigation and other beneficial purposes.

Ecomark : Commercial products may affect environment.

Ecomark is lebelling of the commercial products considering the probable impacts on environment.

Flora : All of the plants present in a given biome is called flora.

Fauna : All of the animals present in a given biome is called fauna.

Characteristics of physiologically dry soil :

Characteristics of physiologically dry soil are—(i) Soil contains excessive saline water which is not utilized by the plants. (ii) This type of soil has poor aeration. (iii) Mangroves grow in this soil.

Population and Community Ecology :

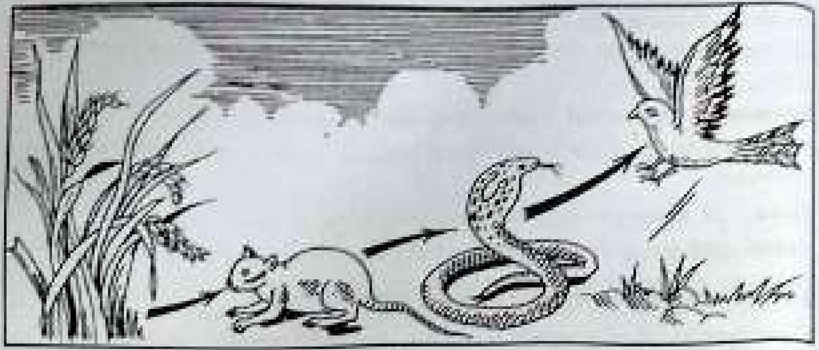
Population is a near permanent group of interbreading individuals of species found in a space or geographical area at a particular time. It is called **Local population** or **deme.** **Metapopulation** is a complex of local populations connected by dispersing individuals. In Ecology population is a group of individuals of the same species living in the same area which functions as a unit of biotic community. Exp. number of grass plants (say cynodon) in a lawn, snails in a garden or pine trees in a forest. All individuals of a population have a similar life cycle and experience similar ecological parameters at similar stage of life cycle. Population of different species remain distinct in a biological community because they are reproductively isolated due to different breeding behaviour and inability to form fertile hybrids.

Population ecology is the study of all aspects of a population and the various factors affecting it in its growth, density, site, multiplication, natality, mortality, competition, tolerance etc. The parametres employed for describing a population are (i) Total number of individuals or population size, (ii) kind and ratio of individuals like male and female, pre-reproductive, reproduction and post reproductive, (iii) Space or area (iv) Time.

Biotic Community is a grouping of different but interacting populations or diff species which live harmoniously in a given locality e.g. pond community, lawn commun forest community. Each such community may further be split in to animal community, pl community and microbe community. Each number of biotic community is called spec It is represented by a population.

2.5 FOOD-CHAIN

The transfer of food energy from producers to consumers through linear trop (nutritional) level in an ecosystem is called food-chain.



Grazing and detritus food-chain :

The grazing food-chain starts from green grass and goes from herbivores (primar consumers) to primary carnivores (secondary consumers) and then to secondary carnivore (tertiary consumers) and so on.

Ex. : Grass → Grasshopper → Frog → Snake → Owl

The dead organic wastes are termed as detritus which serves as a source of energy fo a group of organisms called detritivores. The food-chain is as follows :

Organic substance (Leaves of Mangroves and bacteria) → Detritus consumers (Larva of nsects) → Small carnivore fishes → Large carnivore fishes.]

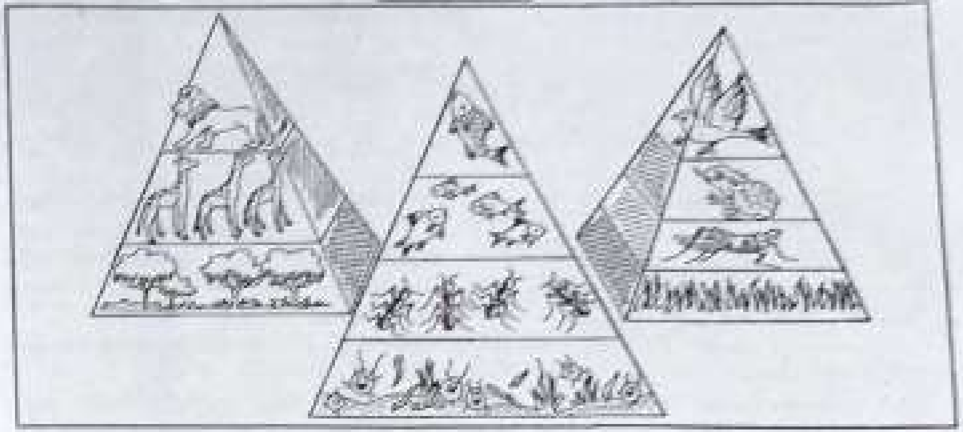
2.6 ECOLOGICAL PYRAMID

The graphic representation of various trophic level in an ecosystem is called ecological pyramid.

Each successive level of nutrition in a food-chain is called trophic level.

It may be of three general types :

(i) Pyramid of Number. (ii) Pyramid of Biomass. (iii) Pyramid of Energy.



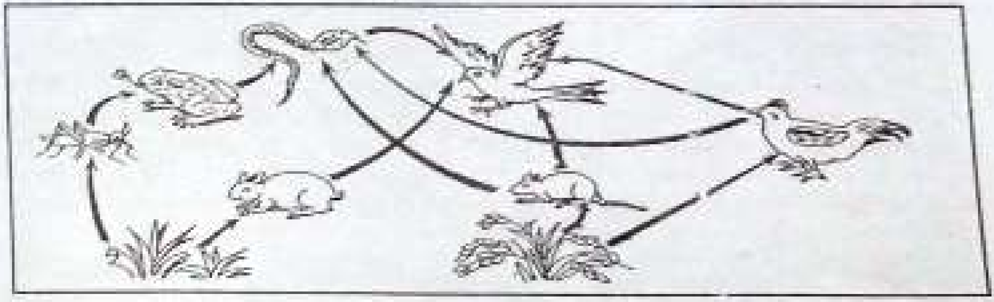
Inverted Pyramid

An inverted Pyramid is just the opposite Pyramid to an ecological Pyramid. An inverted Pyramid is a pyramid with its upside down. Here the number of individuals increases from the lower to the higher trophic levels.

2.7 FOOD-WEB :

It may be defined as the relationship in which a predator eats many type of food and all kinds of food is eaten by many different organisms. It is an outcome of interaction of different food-chains.

Food-web : Food-chains in nature are interconnected in different ways. Such interconnected food-chains in an ecosystem are called food-web.



2.8 ENERGY FLOW IN ECOSYSTEM

Sun is the Primary source of energy in an ecosystem. About 57% of solar energy is absorbed in atmosphere and scattered in space.

The captured solar energy is stored in plants as chemical energy in the form of food through **Photosynthesis.**

The energy stored in plants is passed through community of the ecosystem in a series of phases of eating and being eaten. At each phase of transfer from one trophic level to another about 90% of potential energy is dissipited in different ways like respiration, metabolism etc.

In an ecosystem energy flows in a definite fashion, in three successive stages, such as–

(i) **Acquisition of energy** : The production of glucose by the green plants is the primary production in ecosystem. The total solar energy in the form of chemical energy (ATP) that is present in food is called gross-production.

(ii) **Use of energy** : The plants are devoured by animals and thus potential energy is acquired by them.

(iii) **Unidirectional energy flow** : 20% of solar energy is used up by the green plants due to the photosynthesis mechanism. Again when energy is transferred from one trophic level to the other 80-90% of the potential energy is lost in the form of heat energy. Hence, Pyramid of energy always remains upright, while a gradual decline of energy occurs from the starting point to the termination of a food-chain.

2.9 Plant Succession :

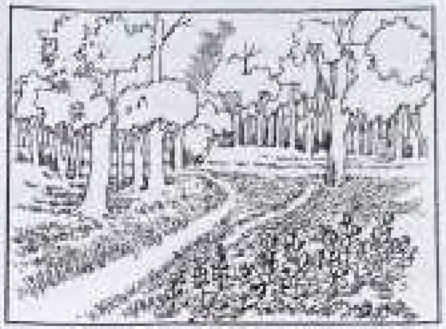
Succession is a universal process which occurs again and again in the history of every climax formation. The successive colonisation of the same area by different plant communities in the cause of development of vegetation is called plant succession. Environment is always kept on changing over a period of time. It influences to bring out marked changes in the dominants or the existing community. This process continues and successive communities develop one after another over the same area until the final community becomes stable for a period of time.

Succession :

'Succession' is a natural process by which environment may be changed and it is also a part of evolution. It is the sequence of communities that develops in an area from the initial stages of colonization. Before the earliest traces of life on earth they have been found in the sea due to the absence of ultraviolet ray just 3.5 billion years ago. The initial lifeless land was successively invaded by different species of plants. That initial stage of evolution was dominated by the plants. That period is known as 'succession.'

2.10 [A] Forest ecosystem

Forests occupy roughly 40 per cent of the land. In India, the forests occupy about one-tenth of the total land area. The forests can be of several types depending upon the climate of the region, i.e., tropical rain forest, tropical deciduous forest, temperate evergreen forest, etc.



(a) ***Abiotic components*** : The abiotic components are water, carbon dioxide, oxygen, nitrogen, calcium, phosphorus, amino acid, humic acids, carbohydrates, protein and fat. Light, temperature, humidity, rainfall, etc. are also important. In addition, dead organic debris—the litter accumulation is a very common feature.

(b) ***Biotic components*** : The living organisms present in the food-chain occur in the following order :-

1. Producers : The producers are mainly trees, shrubs, herbs and grasses. The foliage of the tall trees forms the top storey, the shrubs form the middle storey and the herbs form the bottom storey besides the ground vegetation.

2. Consumers : These are as follow :—

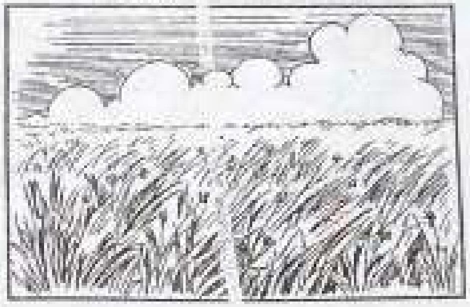
(a) Primary consumers : These are the herbivorous animals feeding on tree leaves like ants, flies, beetles, leafhoppers, spiders, etc., and larger animals grazing on shoots and fruits of the producers like nilgai, deer, moles, squirrels, bats, elephants, monkeys, etc.

(b) Secondary consumers : These are the carnivorous animals like snakes, birds, lizards, etc., feeding on the herbivores.

(c) Tertiary consumers : These are the top carnivores like lion, tiger, etc., that eat other carnivores of secondary consumer level.

3. Decomposers : In this ecosystem, a wide variety of micro-organisms including different species of fungi *Aspergillus, Coprinus, Fusarium, Alternaria, Polyporus, Ganoderma*, etc. *Bacteria Bacillus, Clostridium, Pseudomonas*, etc., and actinomycetes like species of *Streptomyces*, etc. are the decomposers.

2.10.2 [B] Grassland Ecosystems



In Continental type of climate, with uneven distribution of rainfall from 25 to 75 cm per year, temperature from 5° to 25°C forms temperate grasslands. Grasslands, a terrestrial ecosystem, occupy roughly 19 per cent of the Earth's surface.

The various components of a grassland ecosystem are as follows :

(a) Abiotic components : The chief components are temperature, light, moisture and the inorganic and organic compounds such as water, CO_2, O_2, calcium, nitrogen, phosphates, amino acid present in the soil and the aerial environment. Moreover, in addition to the above, some trace elements like Zinc, Copper, Molibdenum are also present in soil.

The grasslands are very common in temperate zone. The best example of these are North American Prairies and Plains, **Pampas** of Argentina and the **Tussock** grasslands of New Zealand.

(b) **Biotic components** : The biotic components of a grassland ecosystem are :

1. **Plants** : They consist of large number of annuals, the grasses which are from 0.5 to 3 metres tall depending upon the rainfall and a small number of bulbous herbs, perennials. Producers are mainly grasses like species of Dichanthium, Digitaria, Cynodon, Setaria, Sporobolus etc.

2. **Consumers** :

(a) **Primary consumers** : We know that the herbivorous animals are primary consumers like cows, buffaloes, deer, sheep, rabbit, mouse, etc., which feed on grasses. Besides them some insects (Leptocorisa, Oxyrhachis, Dysdercus etc.), some termites and millipeds, etc., feed on the leaves of grasses.

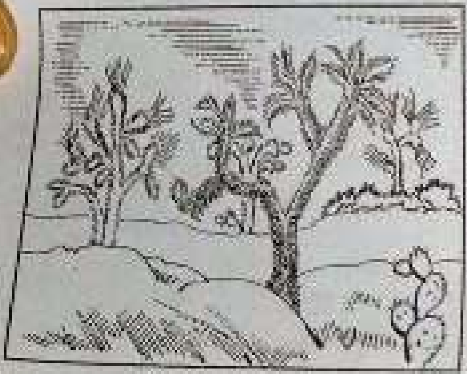
(b) **Secondary consumers : Ex** : Jackals, fox, snakes, frogs, lizards, birds, etc. They are carnivorous animals feeding on herbivores.

(c) **Tertiary consumers** : The hawks feed on the secondary consumers. Thus they are considered as tertiary consumers.

(d) **Decomposers** : Different types of micro-organisms and fungi are decomposers. Fungi are species of Aspergillus, Mucor, Penicillium, Rhizophus, Fusarium, etc. Other micro organisms are different species of bacteria and actinomycets. They bring the minerals back to the soil, thus, making these available to the producers and maintain Bio-geo-chemical cycles and natural balance.

2.10.3 (C) Desert Ecosystem

Deserts occupy about 17 per cent of the surface of the Earth. All major continents have deserts. Major deserts are the Sahara, Gobi, Thar and those of Asia Minor, India, Tibet, China, Mongolia, Australia, South Africa, West Coast of South America and South-West of North America. Deserts are of tropical, subtropical, warm temperate, cool temperate and arctic alpine types.



The important controlling climatic factor is very low rainfall. The rainfall is usually less than 25 cm. and is not uniform over the year. The day temperature is very high (40°—45°C) and nights are cold. (Below 10°C)

Abiotic components : Mineral salts, air, water, soil, temperature, light etc.

Biotic components : (1) **Producers** : Shrubs, grasses, succulents and some trees. Many plants have small, leathery leaves. Perennials have a well developed root system.

(2) **Consumers** : Reptiles, insects which are able to live in hot conditions. Some nocturnal rodents and birds are found there. The ship of desert, camels feed on plants.

(3) **Decomposers** : The decomposers are fungi and thermophilic bacteria.

2.10.4 (1) [D] AQUATIC ECOSYSTEM (Estuary Ecosystem)

Mangrove ecology : The term 'mangroves' is derived from Portuguese word 'mangue' and English word 'grove'. A mangrove tree or bush is called 'mangue' in Portuguese whereas the community of mangrove trees and bushes are called 'mangals'.

The 'coastal tropical forest formation, encircled or spreaded by tidal rivers and/or the sea water, flooded frequently by the tidal water' is known as Mangrove.

On the sea coasts, there are numerous rivers, criss-cross creeks, canals through which tidal water passes twice a day and the shores get enriched with alluvial soils which are the abode of the typical mangroves.

The chunk of the biggest mangrove forests of the Sundarbans is situated on the Ganga-Bramhaputra-delta.

The name 'Sundarbans' are coined either from Sundri, or beautiful forests or from the forests of Sumatra. There is no consensus of opinion.

The Sundarbans as a whole is the biggest forest in the world and its biodiversity is also unique. There are about 40 true mangroves and many associate mangroves. The mangroves of Bhitarkanika in Orissa are also very interesting.

There are many interesting plants in the Sundarbans, among which the following may be mentioned : Sundri (Heritiera), Bine (Avecinnia), Keora (Sonneratia), Garan (Ceriops). Garjan (Rhizophora), Golpata (Nipa), Hental (Phonoenix), Khalsi (Aegiceras), Geua (Exocaria), Dhundul (Xylocarpus) etc.

Adaptive features of mangroves :

(1) Several species of Sonneratia sp. and *Avicennia* sp. develop breathing roots, the pneumatophores, to improve the oxygen supply regularly in submerged soils (Substrates).

(2) The plants like Bine, Garan, Garjan and some others have special characteristic features as they have viviparous germination (within the fruit itself) and fall directly into the mud and starts to grow there directly.

(3) Another important adaptive feature is that the still roots from the main trunk anchor in the loose alluvial soil in an efficient way.

Importance of mangrove Ecosystem :

As the plants are essential in the coastal belt they protect the coast from the surges of the seas, prevent soil erosion and protect the adjoining areas from floods, cyclones and other natural calamities. The plants are good soil binders. Economically, these plants ar of good timbers and an abode for honey production. These plants supply food and oxyge to the ecosystem and maintain natural balance. Mangroves are the shelter for man animals and birds. Thus there the biodiversity is remarkable.

2.10.4 (2) MARINE (OCEAN) ECOSYSTEM

Oceans have been called the largest and the thickest of ecosystem. Major ocea like the Atlantic, the Pacific, the Indian, the Arctic and the Antarctic are inter-connect throughout the world. The average depth of the marine environment is approximate 3,800 metres and life extends to all its depth. The oceans constitute 70% of the eart surface. Oceans can be classified into an upper **photic zone** in which light is available an low **aphotic zone** in which light is not available. The green plants and different types o fishes and the animals are present in the photic zone while non-photosynthetic fung bacteria and some animals are present in the aphotic zone.

Concentration of the nutrients in the ocean is very low. The major zones in marin ecosystem are **littoral, neritic, pelagics** and **benthic**. The **littoral zone** is the shor line between land and the open sea. The **neritic zone** is a region which is shallow enoug to support plants which are rooted to the seafloor. Phytoplankton and zooplankton ar abundant in this zone. Extensive communities of giant kelps, different types of fishes, snail echinoderms, etc., dominate in this zone. The **pelagic zone** is the open sea, constitutin of the 90 per cent of total ocean area. Fin and blue whales are found in this zone. Th benthic zone forms the floor of the ocean. Organisms are sea lilies, sea fern, sponges, snails star fish, sea cucumber and sea urchins.

The biotic components of an ocean ecosystem are as follows—

1. Producers : These are autotrophs and called primary producer. They are responsible for trapping the radiant energy of the Sun with the help of their green pigments. Producers are phytoplanktons, like diatoms, dinoflagellates and some microscopic green algae, brown and red algae (species of *Fucus*, *Laminaria*, *Sargassum*, *Polysiphonia*, etc.)

2. Consumers : These occur in the following sequences :

(a) Primary consumers : The herbivorous animals are the primary consumers. Exp crustaceans, molluscs, fishes etc.

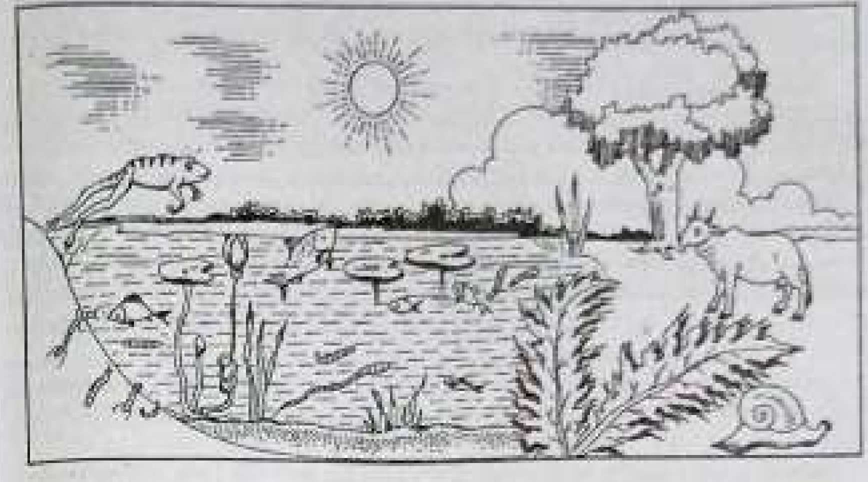
(b) Secondary consumers : These are carnivorous small fishes like Herring, Shad, Mackerel, etc., feeding on the herbivores.

(c) Tertiary consumers : In the top food-chain, there are other carnivorous fishes like Cod, Haddock, Halibut and mammals like whale, sea birds, turtles that feed on carnivores of the secondary consumer level.

3. Decomposers : The micro-organisms like bacteria and fungi are mainly active in the decay of dead organic matters of producers and macro-consumers.

2.10.4 (3) POND ECOSYSTEM

A pond as a whole serves a good example of a fresh water ecosystem and have two main components–(i) Abiotic component and (ii) Biotic component.



(a) *Abiotic components*

The abiotic components are water, dissolved CO_2, oxygen, nitrogen, calcium, phosphorus, amino acid, humic acids, carbohydrates, protein, fat, light, pH value of water. Solar radiation is the main source of energy.

(b) *Biotic components*

Biotic components include the following : (1) Producers, (2) Consumers and (3) Decomposers.

1. Producers : In pond ecosystem producers are of two types—**microphytes** and **macrophytes.** Microphytes are minute floating plants. They are also called **phytoplanktons.** The producers Oedogonium, Spirogyra, Ulothrix, etc., are the producers.

Macrophytes grow in shallow water. They are *Hydrilla*, *Vallisneria*, *Trapa*, *Typha*, *Nymphaea*, etc., Some free-floating macrophytes are *Salvinia*, *Azolla*, *Pistia*, *Wolffia*, *Lemna*, etc.

The green plants convert the radiant energy into chemical energy through the process of photosynthesis.

2. Consumers : In a pond ecosystem primary consumers are of two types—(a) zooplankton and (b) benthos. *Amoeba* (a protozoa), *Daphnia*, *Cyclops* (arthropod), etc., constitute the zooplankton while snails, small fishes, etc., constitute the benthos. Frogs, big fishes, water snakes, crabs, snails, etc., are the secondary consumers and depends upon the primary consumers.

In the pond, besides the secondary consumers, there are consumers of highest order such as water birds, turtles, etc. which are called **tertiary consumers.**

3. Decomposers : A large number of fungi and bacteria attack on dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers (aquatic bacteria, fungi like *Aspergillus, Rhizophus, Fusarium*, etc.). The elements which are liberated by decomposers are again utilised by green plants in their nutrition.

2.10.4 (4) WETLAND ECOSYSTEM

According to Cowardin *et al.* (1979) :

Wetlands are lands, transitional between terrestrial and aquatic systems where the water table, usually at or near the surface of the land, is covered by shallow water. Wetlands have the following three characteristics—(i) at least periodically, the land supports hydrophytes; (ii) the substrate is predominantly undrained hydric soil; (iii) the substrate is saturated with water or covered by water sometime during the growing season of each year.

Generally the ponds, ditches, rivers, streams, lakes, jheels, etc. are defined as wetlands. In the *International* Ramsar Convention of Iran the definition of wetland was—fixed area to be full of water where the depth of the water would be below 6 meters.

Wetlands are estimated to cover about 6% of the Earth's surface. In India, different types of large wetlands are found in Bihar, Assam, Uttar Pradesh, Madhya Pradesh and West Bengal.

Wetlands are classified into three broad groups, i.e., (i) **marine and coastal wetlands**, (ii) **inland wetlands**, (iii) **man-made wetlands.** The depth of water is an important factor. Submerged or emergent plants grow according to depth of water. Wetland soils are generally divided into (a) mineral soils and (b) organic or peaty soil. Wetlands are generally rich in their floristic and faunal diversity.

Wetland fauna comprises of two kinds of animals—(a) those depending entirely on wetland for their whole life, and (b) those utilising wetland for a part of their life-cycle or for particular needs.

(a) Abiotic components

The abiotic components are both organic and inorganic compounds. These are water, carbon dioxide, oxygen, nitrogen, calcium, phosphorous, humic acid, light, temperature, humidity, rainfall etc. Salt concentration and higher clay contents are important abiotic components.

(b) Biotic components

The *living* organisms present in the food-chain occur in the following order—

1. Producers : Wetland producer includes algae, bryophytes, Pteridophytes (mainly *ferns*) to woody angiosperms. In fresh water, a variety of grasses, sedges and cattails (*species of Typha*) are present in wetlands. In salt water, wetland producers are different.

About 50 species of woody plants occur in the mangroves. Numerous herbaceous plants, submerged or free floating occupy different places of wetland.

2. Consumers : These are as follows—

(a) Primary consumers : The herbivorous animals like ants, flies, spiders, cow, sheep, deer, squirrels, crustaceous, molluscs, fish, etc.

(b) Secondary consumers : The carnivorous animals like birds, snakes, carnivorous fishes, fishing cats, crab-eating monkey, etc.

(c) Tertiary consumers : The top carnivores of wetland are mainly turtles, crocodiles, tiger, birds, snakes, etc.

3. Decomposers : The decomposers are the various types of micro-organisms and the detritus animals like protozoa, worms and few other invertebrates. They live in mud near or at the bottom of wetlands and disintigrate or break down the organic matter which is then decomposed completely by fungi, bacteria, etc.

THE NATIONAL WETLAND COMMITTEE FOR WETLAND MANAGEMENT

A National Committee has been formed for management of the various wetlands in our country. This committee has recommended 16 conservation procedures of which the following are famous :

1. Chilka (Orissa)
2. Coleru (Andhra Pradesh)
3. Sukhna (Chandigarh)
4. Pichola Fatesagar (Rajasthan)
5. Kajali and Harike (Punjab)
6. Ullar (Jammu and Kashmir)
7. Kolkat (Manipur)
8. Renuka (Himachal Pradesh)
9. Bhoj (Madhya Pradesh)
10. Kolkata East Wetland

2.10.4 (5) RIVER ECOSYSTEM :

It has high speed and low temperature. In upper reaches water becomes muddy during rains. Detritus from land constitutes important component of food. Producers grow along shallow banks with very slow moving water.

(a) Producers : Alage, encrusting diatoms, aquatic mosses, submerged seed plants, reeds, water grasses etc.

(b) Consumers : Flatworms, Nymphs, Larvel, Snails, Fishes, Otter, Mink, Muskrat, Crocodile, etc.

(c) Decomposers : The micro-organisms like bacteria and fungi are mainly active in the decay of dead organic matters of producers and macro-consumers.

2.10.4 (6) ESTUARIES ECOSYSTEM :

Tidal mouth of river/coastal bay where there is mixing of fresh and sea water. High productive due to turbulance. There are fluctuations in temperature and salinity.

(a) **Producers** : Phytoplankton (blue green algae, green algae, diatoms, dinoflagellat Zooplankton (Protozoans, crustaceans, Rotifers).

(b) **Consumers** : Necton (Fishes and some crustaceans) and Benthos (snails, praw etc.)

(c) **Decomposers** : Bacteria, Fungi.

M.C.Q.

1. Plants tolerant to desert condition are—
(a) Halophyte [✓ (b) Xerophyte] (c) Hydrophyte.

2. The Ramsar site of West Bengal is–
(a) Sundarbans (b) Rabindra Sarovar [✓ (c) East Kolkata Wetland]

3. Which of the following is a nonbiodegradable pollutant–
(a) Organic Waste [✓ (b) Electronic Waste] (c) Night soil.

4. Which one is not a renewable energy source–
(a) Geothermal energy [✓ (b) Solar energy] (c) Fossil Fuel.

5. Cauvery Water dispute is between
(a) Tamil Nadu and Andhra Pradesh (b) Karnataka and Tamil Nadu
(c) Kerala and Tamil Nadu.

6. Conference related to control of ozone depleting substances is—
[✓ (a) Montreal Protocol] (b) Stockholm Conference
(c) Toronto World Conference

7. The skin cancer is caused by–
(a) The Green House Effect [✓ (b) UV Exposures] (c) None of these

8. The allowed thickness of plastic carry bags in the shops is–
(a) 20 microns (b) 30 microns (c) 40 microns

9. Nitrogen fixing bacteria are–
[✓ (a) Rhizobium] (b) Bacillus (c) Dersia

10. Any nuclear reactor generally utilizes-
(a) U^{234} [✓ (b) U^{235}] (c) U^{236}

11. The first detection of ozone hole occurred in–
(a) Pensylvania (b) Caroline Islands [✓ (c) Antarctica]

12. Collectively Sundarban is a–
(a) Sanctuary [✓ (b) Biosphere reserve] (c) Protected forest.

13. The total energy present in food is –
(a) Net production (b) Gross production (c) Average production

14. Food-chain is –
[✓ (a) transfer of energy in different trophic level]
(b) food and eater relationship (c) all the above

15. In a detrius food-chain producer is–
[✓ (a) green plant] (b) waste material (c) no producer

16. In a desert ecosystem rainfall is–
(a) nil [✓ (b) less than 25 cm] (c) less than 100 cm

17. The branch of science that studies the relationship of living organisms with each other and their environment is–
(a) Biology (b) Ecosystem [✓ (c) Ecology]

18. The term ecology was coined by
(a) Alexander Flemming (b) Ronald Ross [✓ (c) Ernst Haeckel]

19. 'Estuary' is
[✓ (a) Inland Wetland] (b) Deforested Area (c) Coastal Wetland

20. 'POP's stand for
[✓ (a) Promoting Ozone Protection] (b) Persistent Organic Pollutants
(c) Persistent Organic Pesticides

21. The fertilizer produced with the help of earthworm is known as
(a) Biofertilizer [✓ (b) Organic manure] (c) Vermicompost

22. 'Ecotourism' is–
(a) Development of more tourist spots
[✓ (b) Tourism based on sustainable exploitation of the ecological aspects of any locality]
(c) Tourism to enjoy wildlife

23. 'BCF'refers to
(a) Bioconservation factor (b) Biochemical factor (c) Bioconcentration factor

24. Which one of the following countries is known as the land of the monsoon?
(a) USA (b) Egypt [✓ (c) India]

25. The environment consists of–
(a) biotic components only [✓ (b) both biotic and abiotic components]
(c) none of these

26. Mangroves are the forests which occur between :
(a) river and land (b) land and lake [✓ (c) land and sea]

27. On earth autotrophic components can directly fix :
(a) mechanical energy [✓ (b) light energy] (c) chemical energy

28. Carrying capacity of the environment is concerned with the growth of
[✓ (a) Species] (b) Population (c) Community

29. Which one in the following is an example of symbiotic bacteria involved in fixation of nitrogen from the atmosphere ?
[✓ (a) Rhizobium sp.] (b) Clostridium sp. EU (c) Nitrobacter sp.

30. The living species on land are the characteristic components of :
(a) Aquatic ecosystem? [✓ (b) Terrestrial ecosystem] (c) Weltland ecosystem

31. Water flowing through the rivers is called :
[✓ (a) lotic water] (b) lentic water (c) marine water

32. The term ecology was coined by–
[✓ (a) Tansley] (b) Mendel (c) Reiter

33. Who is known as father of ecology–
(a) Tansley [✓ (b) Odum] (c) Reiter

34. Study of fresh water ecology is known as–
[✓ (a) Aquatic ecology] (b) Limnology (c) Oceanology

35. Examples of plants adapted to salt water swamps are
[✓ (a) Rhizophora, Ceriops, Heritieia] (b) Rhizophora, Rhizobium. Conifera
(c) Rhizophora, Nipa, diatom

36. Spruce, fir and pine trees are associated with
(a) Tundra biome [✓ (b) Temperate coniferous forest]
(c) Temperate deciduous forest

37. Sugar is produced as a result of the action of
(a) Sunlight and chlorophyll (b) Carbon dioxide and oxygen
[✓ (c) Decomposition of starch by sunlight]

38. 'Loktak' is a
(a) Mountain (b) River [✓ (c) Lake]

39. Mosquito repellant coils contain
(a) DDT [✓ (b) Derivatives of Allethrin]
(c) Benzene Hexa Chloride

40. Largest amount of oxygen is released from
(a) Oceanic ecosystem [✓ (b) Freshwater ecosystem] (c) Desert

41. The famous book 'Fall of a sparrow' is authored by
(a) Rachel Carson [✓ (b) Salim Ali] (c) Gopal Bhattacharya

42. The term 'RSPM' is connected to
(a) Air pollution due to gases (b) Particle size in air pollutant
(c) Smoke volume in air

43. The place 'ARABARI' is related to one of the following
(a) Vanamahotsava (b) Joint Forest Management (c) Autumn Harvesting

44. All corals are
(a) Vertebrates [✓ (b) Invertebrates] (c) Plants

45. For petrol cars alternative fuel may be
(a) LPG [✓ (b) CNG] (c) Either of them

46. 'Ecological Imperialism' is written by
(a) Alfred W. Crosley [✓ (b) Alfred Wallace] (c) None

47. The term ecosystem was coined by–
[✓ (a) Transley] (b) Odum (c) Kreb

48. Forest is a–
[✓ (a) Natural ecosystem] (b) Man-made ecosystem (c) Desert ecosystem

49. Photsynthesis produces :
(a) Protein (b) Fat [✓ (c) Sugar]

50. In atmosphere the content of nitrogen is nearly :
(a) 90 per cent (b) 80 per cent [✓ (c) 70 per cent]

51. Secondary consumers are
[✓ (a) Carnivores feeding on herbivores] (b) Different types of micro organisms
(c) All herbivorous animals

52. For the control of the use of ozone depleting substances a protocol was signed in
[✓ (a) Montreal 1987] (b) Stockholm 1972 (c) Earth Summit 1992

53. Which one of the following does not contain biomass?
(a) Municipal garbage (b) Sewage [✓ (c) Metal]

54. Diatome is a type of :
(a) Herb (b) Bacteria [✓ (c) Plankton]

55. "What do the forests bear? Soil, water and pure air"—is the slogan coined during
(a) Chipko movement [✓ (b) Silent Valley movement]
(c) Save Narmada movement

56. One organism that kills and eats other organism is called
(a) Prey [✓ (b) Predator] (c) Decomposer

57. Which of the following mosquitos is the vector of malarial parasite
[✓ (a) Female Anopheles] (b) Male Anopheles (c) Female Culex

58. Distilled water p^H is :
(a) 8.00 [✓ (b) 7.00] (c) 6.00

59. Quartzite is a an :
(a) Igneous rock [✓ (b) Metamorphic rock] (c) Sedimentary

60. The lower mantle is called :

(a) Asthenosphere (b) mesosphere

(c) metasphere Kms away from the earth

61. The bio-geo-chemical cycle are of :

(a) two types (b) three types (c) four types

62. The Igneous rock is called :

(a) primary rock (b) stratified rock (c) secondary rock

63. The oceans exchange

(a) 600 billion (b) 250 billion (c) 200 billion

64. Which one of the following is a mangrove plant?

(a) Avicennia sp. (b) Mangifera sp. (c) Oryza sp.

65. Producers are—

(a) All types of plants (b) All green plants (c) Only green algae

66. Which of the following may be a tertiary consumer–

(a) Deer (b) Jackal (c) Lion

67. Malaria is a

(a) Vector-borne disease (b) Water-borne disease (c) Soil-borne disease

68. The largest ozone hole is found over

(a) China (b) USA (c) Antarctica

69. Mangroves are found in

(a) Puskar lake (b) Sundarbans (c) Loktak lake

70. Energy flow in an ecosystem is :

(a) Unidirectional (b) Bidirectional (c) Multidirectional

71. The historic earth summit held at Rio, Brazil in June 1992 is also known as

(a) UNCED (b) UNESCO (c) UNICEF

72. The landmass of the earth is known as

(a) Biosphere (b) Lithosphere (c) Stratosphere

73. Following is a Ramsar Site

(a) Rabindra Sarobar (b) Santragachi Jheel (c) East Kolkata Wetlands

74. Sundarban Reserve Forest is

(a) Tropical Evergreen (b) Deciduous (c) Mangrove

75. Which one of the following gases is most abundant in atmosphere?

(a) Methane (b) Nitrogen (c) CFC

76. The interiormost layer of the earth is known as

(a) Core (b) Crust (c) Mantle

77. Free floating microscope organisms are

(a) Plankton (b) Neuston (c) Nekton

78. Malarial Parasite is a type of

(a) Fungi (b) Protozoa (c) Bacteria

79. Which of the following process in not essential for CO_2-O_2 balance in the atmosphere?

(a) Respiration (b) Transpiration (c) Photosynthesis

80. Which of the following gas is able to absorb ultraviolet rays ?

(a) Argon (b) Hilium (c) Ozone

81. Which of the following is related to BOD?

(a) Soil (b) Air (c) Water

82. Jaldapara is famous for the conservation of :

(a) Elephant (b) Rhinos (c) Tiger

83. Jim Corbett National Park is situated at

(a) Madhyapradesh (b) Uttarpradesh (c) Uttaranchal

84. Which one is established by Supreme Court of India to solve environmental problems of different states?

(a) Pollution control board (b) Department of environment (c) Green bench

85. Vaccine of Small-pox was discovered by :

(a) Alexander Flemming (b) Edward Jenner (c) Louis Pasteur

86. National Institute of Oceanography is situated at

(a) Mumbai (b) Panaji (Goa) (c) Chennai

87. 'Arabari Model' in West Bengal is famous for

(a) Joint Forest Management (b) Rainwater Harvesting (c) Solar Power Plant

88. Water of the ocean comprises

(a) 73 per cent of the total water of earth

(b) 63 per cent of the total water of earth

(c) 93 per cent of the total water of eath

89. The world's deepest lake is

(a) Titicaca (b) Baikal (c) Caspian

90. 'Jatropha' is a plant, which is connected to

(a) Biomass fuel (b) Biodiesel (c) Natural gas

91. Earth Day is observed on

(a) June, 5 (b) April, 22 (c) March, 12

92. Which one of the following is an autotroph?

(a) Jelly fish (b) Green algae (c) Amoeba

93. The living species on land are the characteristic components of
(a) Terrestrial ecosystem (b) Acquatic ecosystem (c) Wetland ecosyst

94. Of the following which does not contain biomass?
(a) Municipal Garbage (b) Sewage (c) Plastic materials

95. Niche implies
(a) Abiotic and biotic factors (b) Only biotic factors (c) None of these

96. Which one of the following is capable of entrapping solar energy?
(a) Producers (b) Decomposers (c) Primary consumer

97. Profuse growth of aquatic vegetation that often changes the colou water and reduces the dissolved oxygen concentration is
(a) Algae bloom (b) Eutrophication
(c) Fermentation (d) Both (a) and (b)

98. Ramsar Convention 1971 was aimed at the conservation of
(a) Wastelands (b) Wetlands (c) Deserts

99. Following is a primary consumer
(a) Green plant (b) Deer (c) Tiger

100. Total number of Tiger projects in India is
(a) 17 (b) 19 (c) 23

101. The flow of energy in ecosystem is always
(a) Unidirectional (b) Circular (c) Multidirectional

102. The percentage of incoming solar energy conserved by green plant is
(a) 0.1% (b) 1% (c) 10%

103. The earlier traces of life on earth have been found about
(a) 2.5 billion years ago (b) 4.5 billion years ago
(c) 3.5 billion years ago

104. Which one of the following is an example of symbiotic bacteria involv in fixation of nitrogen from the atmosphere
(a) Rhizobium sp. (b) Clostridium sp. (c) Nitrobacter sp.

105. Biosphere is made of
(a) Atmosphere (b) Lithosphere (c) All of them

06. The branch of science that studies the realationship of living organis with each other and their environment is
(a) Biology (b) Ecosystem (c) Ecology

107. Organism that kills and eats other organism is called
(a) Predator (b) Parasite (c) Decomposer

108. A sequence of transfer of food energy from organism in one trophic level to those in another is called
(a) Nutrient cycle (b) Food cycle (c) Food chain

109. Troposphere is situated in the equitorial region from the earth's surface at a height of about
(a) 16 kilometers (b) 8 kilometers (c) 50 kilometers

110. In atmosphere the content of oxygen gas is nearly
(a) 23 per cent (b) 78 per cent (c) 16 per cent

111. Plasmodium vivax can cause
(a) Filaria (b) Malaria (c) Dengu

112. The name of Rabindra Nath Tagore is connected with
(a) Joint Forest Management (b) Vanamahotsava (c) Tree hugging movement

113. The Physical space occupied by an organism is known as
(a) Niche (b) Habitat (c) Ecotone

114. Study of 'Habitat' is known as
(a) Ecology (b) Entomology (c) Ethology

115. Following is not found in natural condition in India
(a) Tiger (b) Zebra (c) Rhinoceros

116. Lithosphere represents the earth's
(a) Water (b) Land (c) Life

117. A Bengali novel on forestry and environment is
(a) 'Rupashi Bangla' (b) 'Sabhyatar Sankat' (c) 'Aranyak'

118. Which of the following is a man-made ecosystem–
(a) Cropland (b) Acquarium (c) All

119. Ecosystem is a–
(a) Self-regulatory system (b) Osmoregulatory system (c) Computer

120. Decomposers are–
(a) Top consumers (b) which can degrade all the consumers
(c) fungi and bacteria

121. Energy flow in a ecosystem is–
(a) Bidirectional (b) Multidirectional (c) Unidirectional

122. The Zone where fresh water mixes with marine water is termed as
(a) Bathial (b) Profundal (c) Estuary

123. The percentage of oxygen in air is
(a) 78.08 (b) 20.05 (c) 0.03

124. The layer of atmosphere that contains all the Ozone gas is

(a) Troposphere (b) Stratosphere (c) Mesosphere

125. The average temperature of Earth is about

(a) 15°C (b) 20°C (c) 25°C

126. The amount of nitrogen in atmosphere is–

(a) 72% (b) 75% (c) 78.08%

127. The name 'Ecosystem' was given by

(a) Smith (b) Kant (c) Tansley

128. Fertilizer is a

(a) Radioactive pollutant (b) Organic pollutant (c) Ingorganic pollutant

129. Which amongst the following is a decomposer in ecosystem?

(a) Green plant (b) Animal (c) Bacteria

130. Which amongst the following is a primary consumer?

(a) Bacteria (b) Tiger (c) Goat

131. Non-living components of ecosystem are

(a) Biotic (b) Abiotic (c) Free-living

132. The process by which anaerobic decomposition of organic matter by bacteria gives out a bad smell is

(a) Decomposition (b) Fermentation (c) Putrefaction

133. Profuse growth of aquatic vegetation that often changes the colour of water and reduces the dissolved oxygen content is called

(a) Algai bloom (b) Eutrophication (c) Fermentation

134. In marine ecosystem the zone which support plants rooted to the sea floor is known as—

(a) Littoral zone (b) benthic zone (c) neritic zone

135. In an aquatic ecosystem the deep water part where there is no effective light penetration is known as—

(a) littoral zone (b) limnetic zone (c) profundal zone

136. The famous convention for Wetland Management in 1971 is known as—

(a) Wetland Convention (b) Earth Summit (c) Ramsar Convention

137. Which of the following is a mangrove—

(a) Rhizophia (b) Avicinia (c) All

ANSWERS

1.(b) Xerophyte 2.(c) East Kolkata Wetland 3.(b) Electronic Waste 4.(c) Fossil Fuel. 5.(b) Karnataka and Tamil Nadu 6.(a) Montreal Protocol 7.(b) UV Exposures 8.8.(c) 40 microns 9.(a) Rhizobium 10.(b) Urd 11.(c) Antarctica 12.(b) Biosphere reserve 13.(b) Gross production 14.(c) all the above 15.(b) waste material 16.(b) less than 25 cm 17.(c) Ecology 18.(c) Ernst Haeckel 19.(c) Coastal Wetland 20. (b) Persistent Organic Pollutants 21.(c) Vermicompost 22.(b) Tourism based on sustainable exploitation of the ecological aspects of any locality 23.(c) Bioconcentration factor 24.(c) India 25.(b) both biotic and abiotic components 26.(c) land and sea 27.(b) light energy 28.(b) Population 29.(a) Rhizobium sp. 30.(b) Terrestrial ecosystem 31.(a) lotic water 32.(c) Reiter 33.(a) Tansley 34.(b) Limnology 35.(a) Rhizophora, Ceriops, Heritieia 36.(b) Temperate coniferous forest 37.(a) Sunlight and chlorophyll 38.(c) Lake 39.(b) Derivatives of Allethrin 40.(a) Oceanic ecosystem 41.(b) Salim Ali 42. (b) Particle size in air pollutant 43.(b) Study of behaviour 44.(b) Invertebrates 45.(b) CNG 46.(a) Alfred W. Crosley 47.(a) Tansley 48.(a) Natural ecosystem 49.(c) Sugar 50.(b) 80 per cent 51.(a) Carnivores feeding on herbivores 52.(b) Stockholm 1972 53.(c) Metal 54.(c) Plankton 55.(a) Chipko movement 56.(b) Predator 57.(a) Female Anopheles 58.(b) 7.00 59.(b) metamorphic rock 60.(b) mesosphere 61.(b) three types 62.(a) primary rock 63.(c) 200 billion 64.(a) Avicennia sp. 65.(b) All green plants 66.(c) Lion 67.(a) Vector-borne disease 68.(c) Antarctica 69.(b) Sundarbans 70.(a) Unidirectional 71.(a) UNCED 72.(b) Lithosphere 73.(c) East Kolkata Wetlands 74.(c) Mangrove 75.(b) Nitrogen 76.(a) Core 77.(a) Plankton 78.(b) Protozoa 79.(b) Transpiration 80.(c) Ozone 81.(c) Water 82.(b) Rhinos 83.(c) Uttaranchal 84.(c) Green Bench 85.(b) Edward Jenner 86.(b) Panaji (Goa) 87.(a) Joint Forest Management 88.(c) 93 per cent of the total water of earth 89.(b) Baikal 90.(b) Biodiesel 91.(b) April, 22 93.(a) Terrestrial ecosystem 94.(c) Plastic materials 95.(a) Abiotic and biotic factors 96.(a) Producers 97.(d) Both (a) and (b) 98.(b) Wetlands 99.(b) Deer 100.(b) 19 101.(a) Unidirectional 102.(a) 0.1% 103.(c) 3.5 billion years ago 104.(b) Clostridium sp. 105.(c) All of them 106.(c) Ecology 107.(a) Predator 108.(c) Food-chain 109.(a) 16 kilometers 110.(a) 23 per cent 111.(b) Malaria 112.(b) Vanamahotsava 113.(b) Habitat 114.(a) Ecology 115.(b) Zebra 116.(b) Land 117.(c) 'Aranyak' 118.(c) All 119.(a) Self-regulatory system 120.(c) fungi and bacteria 121.(c) Unidirectional 122.(c) Estuary 123.(b) 20.95 124.(b) Stratosphere 125.(a) 15°C 126.(c) 78.08% 127.(c) Tansley 128.(b) Organic pollutant 129.(c) Bacteria 130.(c) Goat 131.(b) Abiotic 132.(c) Putrefaction 133.(b) Eutrophication 134.(b) benthic zone 135.(c) profundal zone 136.(c) Ramsar Convention 137. (c) All

Fill up the blanks :

Q.1. Sunderban is a kind of——forest.

Ans. Mangrove.

Q.2. Primary producers are also known as——.

Ans. Autotrophs.

Q.3. Natural processes that recycle nurients in various chemical forms is called——cycle.

Ans. Biogeo chemical.

Q.4. Organisms that digest dead organisms and wastes of living organisms in known as——.

Ans. Decomposer.

Q.5. Sand stone is a——rock.

Ans. Sedimentary.

Q.6. The Symbiotic association between a fungus and the roots of a plant is termed as ——.

Ans. Mycorrhiza.

Q.7. The relationship between environment and the living being is called

Ans. Ecosystem.

Q.8. The animals which live at the bottom of the sea are called——.

Ans. Benthos.

Q.9. In a lake Ecosystem——is the second trophic.

Ans. Zooplankton.

Q.10. The area of forest & woodland is——% of total land mass of earth.

Ans. 27.

Q.11. 28th February is observed as——and 5th June is observed as——

Ans. National Science day, Environment day.

Q.12. Ecosystem is a——of Ecology.

Ans. Unit.

Q.13. Carrying capasity is influenced by——.

Ans. Productivity.

Q.14. The water which flows through the rivers called——water.

Ans. Lotic.

Q.15. The names of two nitrifying bacteria are—— and——.

Ans. Nitrosomonas, Nitrococcus.

Q.16. The difinition of Biogeochemical cycle is the movement of the essential elements like C, H, O, N, P, S, Ca etc. in between _____ and ____.

Ans. environment, organisms.

Q.17. The term 'Ecology' originates from the Greek word——.

Ans. Oikos and Logos.

Q.18. Most of the nitrogen fixation in earth is due to——fixation.

Ans. bacterial.

Q.19. The term ecology originated from——word.

Ans. Oikos and Logos (Greek)

Q.20. The 'Earth Summit' was held at Rio in the year——.

Ans. 1992

Q.21. The stagnent water of the pond called as——water.

Ans. Lantic

Very Short Answer type Questions

Q.1. What is habitat?

Ans. Place or ervieonment in which specir'ided organisms live.

Q.2. Who coined the term ecology and in which year?

Ans. Haeckel, 1870.

Q.3. Who coined the term 'Ecosystem'?

Ans. Tansley, 1935.

Q.4. What is the definition of wetland?

Ans. Fixed area to be full of water where the depth of the water should be below six meters.

Q.5. Who is the ~~anther~~ auther of the book 'Silent spring'?

Ans. Ratchel carson.

Q.6. What are the major Components of Environment?

Ans. Environment has two components—

(a) Biotic (all living beings) (b) Abiotic (all non-living entities)

Q.7. What is hydrological cycle?

Ans. The interchange of water between atmosphere, sea. land and between living organisms and their environment is cuHed hydrological cycle.

Q.8. What is ecology?

Ans. Scientific study of the relationships of living organisms with each other and wi their environment is called ecology. The term is derived from the greek word 'oikos' home and logos = study.

Q.9. What are the major Components of ecosystem?

Ans. Ecosystem has two major Components:

(1) Biotic components : Plants and animals (Producer, Consumers, Decomposers)

(2) Abiotic Components : Water, sun, soil, air and inorganic substances.

Q.10. What is food web?

Ans. In an ecosystem Food chains are inter-connected in different ways such connected food chains are called food web.

Q.11. What is the area of wetland on earth?

Ans. At present about 5.47% of the total area on the earth.

Q.12. Give an example of decomposing organism.

Ans. Bacteria, Fungi (Aspergillus, Rhizophus, Fusarium etc).

Q.13. What is the term applied to the structure formed collectively by th living organisms of an ecosystem.

Ans. Biotic Factor (Components).

Q.14. How is the net primary productivty and gross primary productivi determined?

Ans. Gross Primary production—use of energy by the plant during different metabol activities = Net Primary Production.

The total energy that is present in food produced by the green plants is called gross priman production.

Q.15. Define wetland.

Ans. Wetlands are lands, transitional between terrestrial and aquatic system where th water table usually at or near the surface of the land, is covered by shallow water—Cowardi et al (1979)

Q.16. What is deciduous forest?

Ans. A terrestrial forest where the trees are liable to be shed at a certain period.

Q.17. What is human ecosystem?

Ans. Human Ecosysem is an artificial ecosystem. In this eco system man plan manipulations in physiochemical environment of city and cropland for his own benefits.

Q.18. Name the Components of physical environment?

Ans. Temperture, light (Meteorological Components), Inorganic Components (soil, minerals, water, air) and organanic components (Dead and decomposed bodies of organism)

Q.19. Name the components of Bio-sphere?

Ans. Flora & Fauna (Living organisms) i.e autotrophic and heterotrophic Components.

Q.20. What is grazing food chain?

Ans. Grass — Grass hopper — Frog — Snake — owl. This food Chain starts from gree plants (Producer) and goes through primary consumers (Herbivores), Primary carnivores (Secondery Consumers) Secondary Carnivores (tertiary consumers) and then to highest level consumers (Exp : .peacock, owl Tiger)

Q.21. What is Biome?

Ans. The natural assemblages of plants and animals extending over large areas or a plant and animal community that covers a large geographical area is krown as Biome. Biome is a major terrestrial biotic community characterised by distinctive life forms.

Q.22. What is ~~Biomass~~. Biomass?

Ans. The total weight of living organisms per unit alea is known as Biomass

Q.23. What is ecology?

Ans. Ecology is the study of plants and animals in relation to their habits and habitats.

Q.24. What is food chain?

Ans. A 'food chain' may be difined as the transfer of energy (nutrients) through a succession of organisms by repeated process of eating and being eaten. Exp. Greengrass—grasshopper—Frog—Snake-Owl

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Short Type Question Answer

Q.1. State the importance of mangrove forest.

Ans. (i) The plants of the mangrove forest protect the coastal belt from the surges of the seas.

(ii) Prevent Soil erosion.

(iii) Protect the adjoining areas from floods, cyclones and other natural calamities.

(iv) The mangroves maintain the equilibrium of the bio-diversity mainly the animals and birds.

(v) These plants are economically important as they are of good timber and an abode for honey production.

Q.2. Name a mangrove forest of West Bengal and orrissa.

Ans. Sundarban in West Bengal and Esluarise of Mahanadi in orissa.

Q.3. Define Ecosystem.

Ans. The ecosystem is the basic functional unit in ecology where it includes all the living organisms (plants and animals) in an area interacting with the physical environment.

Q.4. What do you mean by primary consumers, secondary consumers, Tertiary consumers? What is Decomposer?

Ans. The living members of an ecosystem which consume the food synthesized by producers are known as consumers.

(1) **Primary consumers** : The herbivorous animals that are dependent for their food on producers are regarded as Primary consumers : Exp. Insects, Deer, cow etc.

(2) **Secondary consumers** : The carnivorous and omnivorous animals that are dependant for their food on primary consumers are known as secondary consumers. Exp. crow, frog, fox, dogs, etc.

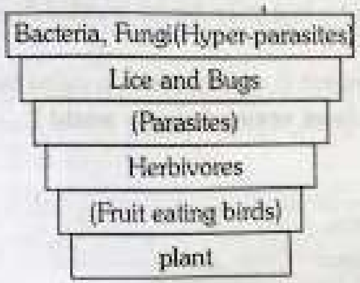
(3) **Tertiary consumers** : These are the top cornivores which prey upon cornivores, omnivores and also herbivores. Exp. lions, tigers, eagle, shark etc.

(4) **Decomposer** : The organisms which attack the dead remains of producers and consumers and degrade the complex organic substances and produce simple basic elements as their food are regarded as Decomposer.

Exp. Bacteria, Fungi.

Q.5. What is an inverted pyramid?

Ans. An inverted Pyramid is just a opposite Pyramid to an ecological Pyramid. An inverted Pyramid is a pyramid with up side down where the number of individuals increases from the lower to the higher trophic levels.



Q.7. Definine ecological niche.

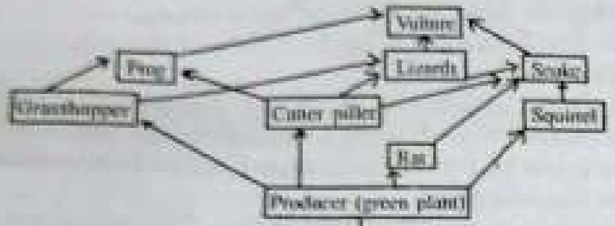
Ans. 'Ecological niche' refers to the habitat, role and position of a species within community or an ecosystem which includes all physical, chemical and biological conditions species need to live and reproduce.

Q.8. What is a Ramsar site ?

Ans. Ramsar site is internationally recognized site on wetland conservation as decided the Ramsar Convention in 1971. Wetland of east kolkata is an example of Ramsar site.

Q.9. What is food Web ?

Ans. Food chains in nature are interconnected in different ways. Such interconnec food chains in an ecosystem are called food web.



FOOD WEB

Q.10. What is ecological foot print?

Ans. The measurment of the ecological impact of the use of land destruction of fores consumption of food, wood products is known as ecological foot print.

Q.11. What are grazing and detritus food chain?

Ans. The grazing food chain starts from green grasses and goes from herbivores (primar consumers) to primary carnivores (secondary consumers) and then to secondary carnivore (tertiary consumers) and so on.

Grasses—Grasshopper—frog—snake—owl

The dead organic wastes are termed as detritus which serves as a source of energy for group of organisms called detritivores. The food chain is organic substance (Leaves of Mangrove and bacteria) → Detritus consumers (Larva of insects) → small carnivore fishes → Larg carnivore fishes.

Q.12. Who is flora?

Ans. All of the plants present in a given biome is called flora.

Q.13. What is fauna?

Ans. All of the animals present in a given biome is called fauna.

Q.14. Name four grassland ecosystems in world ?

Ans. (i) Steppes of Asia.

(ii) Veldts of south Africa.

(iii) Fairies of North America.

(iv) Pampas of south America.

Q.15. What is meant by 'benthos'?

Ans. Living organisms attached or living in the bottom sediments of water bodies are known as "benthos". Exp. Snail.

Q.16. What is meant by 'Nekton'.

Ans. Living organisms floating or swimming in the middle layer of water bodies are known as Nekton. Exp. Prawn.

Q.17. State the characteristics of physiologically dry soil.

Ans. Characteristics of physiologically dry soil are—(i) Soil contains excessive saline water which is not utilized by the plants, (ii) This type of soil has poor aeration, (iii) Mangroves grow in this soil.

Q.18. What is Levee?

Ans. The natural or artificial (man made) riverside embankment is called 'Levee'.

Q.19. What is ecological restoration?

Ans. Ecological restoration related with the recovery and conservation system of the ecosystem along with endangered species which are threatend due to pollution and urbanisation.

Single /Multiple Answer-type Questions

Read the following passages (small essays) carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages (Small passages) :

Passage 1

The green autophytic plants are able to synthesise carbohydrates from certain inorganic (CO_2, H_2O) constituents from the environment with the help of chlorophyll in the presence of sunlight (photosynthesis). Those autophytic plants are regarded as 'producers. The living members of an ecosystem which consume the food synthesized by producers are known as consumers.

The herbivorous animals that are dependent for their food on producers are regarded as Primary consumers : Exp. Insects, Deer, Cow etc.

The carnivorous and omnivorous animals that are dependant for their food on primary consumers are known as secondary consumers. Exp. crow, frog, fox, dogs, etc.

Tertiary consumers are the top cornivores which prey upon cornivores, omnivores and also herbivores. Exp. lions, tigers, eagle, shark etc.

The organisms which attack the dead remains of producers and consumers and degrade the complex organic substances and produce simple basic elements as their food are regarded as Decomposers. Exp. Bacteria, Fungi.

Statement 1 : Carnivorous animals are dependent for their food on Primary consumers.

Statement 2 : Insects are herbivorous animals.

Statement 3 : Fungi is a producer on which all the organisms depend for th nutrition.

Ans. ● ● ○
1 2 3

Passage 2

Deserts occupy about 17 per cent of the surface of the Earth. All major continen have deserts. Major deserts are the Sahara and those of Asia Minor, India, Tibet, Chin Mongolia, Australia, South Africa, West Coast of South America and South-West o North America. Deserts are of tropical, subtropical, warm temperate, cool tempera and arctic alpine types.

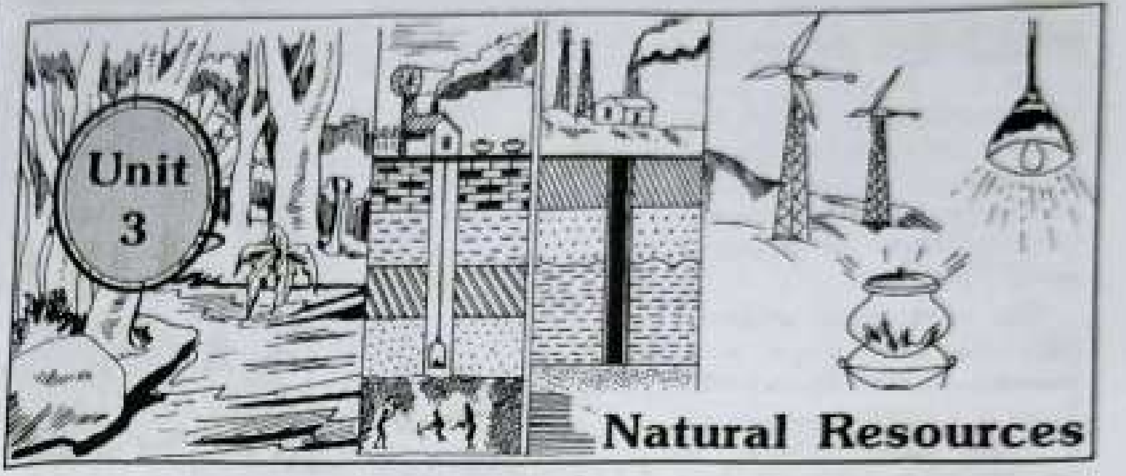
The chief controlling climate factor is very low rainfall. The rainfall is usually les than 25 cm. and is not uniform over the year. The day temperature is very high an nights are cold.

Statement 1 : The rainfall in desert is more than 50 cm.

Statement 2 : Sahara is a desert of Africa.

Statement 3 : The day temperature is high and nights are cold in desert.

Ans. ○ ● ●
2 3



Unit 3

Natural Resources

3.1 RENEWABLE AND NON-RENEWABLE RESOURCES :

The energy resources which can be used continuously year after year and do not get exhausted in a few years and also can be replenished rapidly through natural cycle and human activities are known as Renewable Resources : Exp : Forest, Water, Fish.

The energy resources which can not be replenished at all through natural cycles or human activities and may be exhausted in a few years are known as Non-Renewable Resources :

Exp : Fossil fuels like coal, petroleum, etc.

3.2 RESOURCES AND ASSOCIATED PROBLEMS :

Problems of Non-Renewable Resources are :

(i) The sources have been in use since long time and have become a convention.
(ii) The sources of energy cannot be replenished.
(iii) The sources may be exhausted in a few years.
(iv) These sources cause environmental pollution.

Problems of Renewable Resources :

(i) The requirement of water is increasing day by day and the ground water level goes down due to excess use of ground water for agricultural purpose.

(ii) The area of forests is half of which it was 75 years ago. Human interference and commercial pressures are increasing for housing, building in towns, cities and on roadways.

(iii) Human activities are creating a lot of problems for bio-diversity. Some plants and animals are on the verge of extinction.

3.3 FOREST RESOURCES :

Forest is an area that is set aside for the production of timber and the forest produce that are maintained under woody vegetation for certain indirect benefits (climate or protective) which it provides.

The word 'forest' is derived from the latin word 'foris' meaning outside. The reference being is a village boundary and it must have included all uncultivated and unhabited land.

As per Report of **Survey of India (2000)** :

The forest area of India is only 19.39% of the total land area. But it is necessary to ha at least 33% forest area for healthy environment.

The areas of different kind of forest are as follows :

But at present	Deep or dense forest –	11·48%
	Open forest –	7·76%
	Mangrove forest –	0·15%
	Total–	19·39%

3.4 IMPORTANCE OF FOREST :

(i) **Protective function** : *Forests preserve the physical features of the earth, check so erosion, prevent floods and dought.*

(ii) **Productive function** : *Forests meet the need of timber, fuel, bamboo, gums, resin dyes, tans and medicinal drugs.*

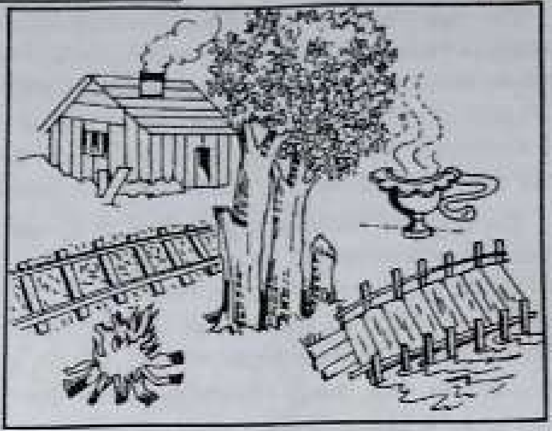
(iii) **Conservational function** : *Forests provide shelter to the wild-life and help maintain the ecological balance of nature.*

(iv) **Recreational function** *of forest is important for human beings.*

3.5 USE AND OVER–EXPLOITATION :

Timber is very important from the economial point of view. For a long time timber ha been used up for construction of building, body of vehicles, Railways, Supports paper etc Now-a-days the demand of medicinal plant is increasing. Multinational companies are engaged in production of medicines from plants. For these reasons the area of forest i decreasing day by day.

3.6 DEFORESTATION :



We are at present destroying about 15 Laks hectors of forest per year. In our country 2 crores 20 lakhs hector land of forests has been destroyed already for the development programme of human beings.

Every year at an average the population is growing by 17 millions in India. Out of six people in the world one is Indian. More people mean more pollution of the environment. Therefore the entire ecosystem is under stress.

Case Study

(i) CHIPKO MOVEMENT

The Chipko Movement is the most well-known people's movement in respect of environmental protection in India. It is a movement of those people who are living in and around the forests that sustain their lives.

The destruction of forests for the survival of the local people through commercial forestry created the Chipko Movement first in the Himalayan area of U.P. Then the movement gradually spread to other mountain-areas such as the Western Ghats, the Aravallis and the Vindhyas.

Villagers have created an effective non-violent way to stop the devastation of forest by the industries. When the axeman comes the people, mainly the women form circles around the trees—they embrace the trees. This have given the movement its name, the tree 'hugging movement', or Chipko Andolan.

The movement was initiated for the protection of forests in India at the end of the year 1960. The main objective of the movement, however, was to ensure survival of the tribal people. Notable among these movements are those of the people of the Singhbhum and the Baster regions. Later on Sundarlal Bahuguna joined in this movement. These movements have sought to convert mixed natural forests into monoculture of commercial species like teak or tropical pine. It is because this process of conversion that leads to the destruction of the material base for the survival of a large proportion of the tribal people. The movement was so intensified that P.M. of India declared that a single tree would not be touched for the next 15 years.

(ii) SILENT VALLEY MOVEMENT

Silent valley is a densely-forested valley that is situated in Palghat district of north Kerala. The name is given as "silent valley" as the forest is very deep, dark and extremly peaceful. The river Kunithpara which is not navigable, is flowing across this valley from North to South.

The state government planned to construct a dam along the slopes of the river. A Bri technical expert opined that, hydroelectricity could be easily generated from this flow stream and the Planning Commission approved the proposal.

Later on, in 1976, a task force headed by the vice president of W.W.F. (World Wild Fund) in their report advised not to implement the project. They advised that, if the proje was implemented then, it would cause ecological disbalance in that region.

The popular sciences organization of Kerala (Kerala Shastra Sahitya Parisad, KSSP started a movement to stop the project. They went for mass-signature campaign. T resolution of the project was accepted in the aessembly. KSSP wrote a booklet an vehimently opposed this project. They forced the government to postpone the projec Morarji Desai, the then prime minister of India also supported the project along with sta government. But many environmentalists like Salim Ali, of IUCN rallied and protest against its implementation.

Ultimately in December, 1980, the Kerala Government announced to reject the projec The Silent Valley was declared as a National Park.

3.7 TIMBER EXTRACTION, MINING AND DAMS :

The demand of fuelwood are increasing. The ruthless destruction of timber, mining an construction of dams lead to the changes of flora and vegetation. When forest are destroye due to timber extraction, mining and dams; ecological balance is disturbed. It is a threa for forests and also for the tribal peoples.

DESTRUCTION OF FORESTS AND DESERTIFICATION :

Forests are vanishing everywhere in an alarming pace. It also hits the ecology an physical basis of a country.

Ruthless destruction of land leads to desertification. For the growing demands of citie forests are also destroyed. Due to destruction of forests ecological balance is disturbed and the natural corollaries are floods, droughts, etc. In other words, the importance of forest is enormous.

Desertification is the process leading to desert formation either due to natural phenomena or due to bad use of land. Destruction of flora and vegetation leads to the changes of atmosphere, climate, etc.

In many countries including India where there are explosion of human population, there is tremendous pressure for supply of wood and naturally forests are the targets.

The demand for fuelwood are increasing day to day. Paper, board, newsprint-industries are consuming much of our wood. There is a great increase in newspaper industries. For the maintenance of the forest cover in its proper perspectives, maintenance and sustainability of water supply are essential. Therefore management of water-sheds and catchment areas are extremely vital for a country.

DAM CONSTRUCTION AND EFFECTS ON FORESTS & TRIBAL PEOPLE :

Two largest dam reservoirs **'Sardar Sarovar'** and **'Narmada Sagar'** were planned to be constructed over Narmada in Gujrat and Madhya Pradesh respectively. Narmada Valley, where the ancient civilization and culture were grown by oldest races like **Bhils** and **Gondas** of Indian civilization. It was reported later on that more than one million villagers including the **tribal people** (Bhils & Gondas) would be badly affected and the plants and animals resources would be lost if the project was fulfilled completed.

Mining and effects on forest and tribal people :

Mining is a robber industry. Our present material civilization has been brought about, to a large extent by the application of metals and minerals. Continuous mining is going to exhaust the ore. The land is becoming very scarce in due to incresing population. Due to mining, we are also destroying the forests and thousands of tribal people are becoming homeless. **Tribal displacement** is a problem of modern civilization. Many tribal people are supposed to become **refugees.**

Some Data in respect of Tribal Displacement :

(1) 2 lakhs tribals were displaced due to the construction of the **Rehand dam** and **Singrowale super thermal station.**

(2) 85,000 tribals were displaced due to the construction of Narmada & Sardar Sarobar dam.

(3) 15,000 tribals were displaced due to the **Bodhghat project.**

Afforestation

For maintaining eco-system it is necessary to maintain equilibrium of ecology and this equilibrium maintains biological diversity, acts as a reservoir in respect of soil and water conservation. It also prevents flood and protects the interest of the tribal communities and many other practical day-to-day problems for those who depend on forest resources. In order to meet their demand, well-calculated and extensive afforestation programmes, should be launched both for indigenous and exotic plants. In this respect, a few years back, an extensive social forestry programme was introduced in respect of the quickly growing species of plants.

As the planning was not meticulously followed the afforestation programmes were not very successful. Anyhow, efforts are still going on for the successful implementation of the programme.

3.8 WATER RESOURCES :

The most important resource of our earth is water. The main component of our body is water (92%). Water helps to keep a live the Protoplasm. Water is an essential component for Photosynthesis.

About 73% area of our earth is marked for water land. But we can use only 0·5 – 1% of total water body.

Distribution of Water :

Sea and Ocean : 97·6%
Ice : 2·07%
Ground Water : 0·207%
Surface Water : 0·80%

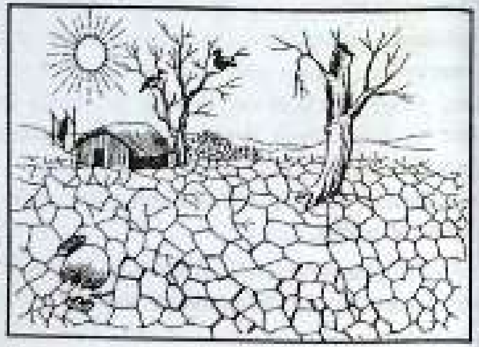
The demand of water for agriculture, domestic purposes, industries, i.e., for modern civilization is increasing rapidly. About 30% of the total people of the earth is facing the water problem.

Use and Over-Utilization of Water :

The global distribution of water resources reveals that less than 3% of the total quantity of water is fresh water. Only $\frac{1}{5}$th of the fresh water is available in liquid form. This limited amount is replenishible. More than 90% of this scarce commodity is in the form of ground water. While only 1% is in the lakes and ponds.

The total requirement of water has increased from 38 M ha – m in 1974 to 54 M ha-m in 1985 and about 100 M ha-m in 2013. The projected figure for 2025 AD is 140M ha-m as per report or NLWC.

Over-utilization of water due to the faster growth in the demand of water in different industrial sectors and Urbanisation in respect of is creating many problems this scarce commodity. The earth is now facing scarcity of water and water pollution.



Drought

Drought is a natural calamity. It is the dry condition of the nature. If there is no normal rainfall or there is a continuous absence of rain for a large number of years, the unnatural dry condition is known as **drought**.

Types of drought and its effect on environment :

In general, there are *three types* of droughts as follows :

(a) Dry spell : During the rainy season if there is a continuous rain for less than 0.8 mm the situation may be termed as **dry spell**.

(b) Partial drought : During the rainy season, if there is a continuous rainfall of less than 0.2 mm for a month the situation may be termed as **partial drought.**

(c) Absolute drought : During the rainy season, if there is absolutely no rain for about a fortnight the situation is known as absolute drought.

But the position of drought differs from country to country according to the intensity of rainfall.

Causes of drought :-

(a) Natural causes :

(i) The atmospheres become very hot and dry due to some natural causes, So drought occurs to a great degree.

(ii) The average temperature of the globe increases, thereby causing drought-like situation due to the **Greenhouse Effect.**

(iii) If there is more vapourisation than the rainfall, drought may occur.

(b) Man-made causes :

(i) Excessive and unplanned felling of trees lead to lessening of atmospheric water vapour. Therefore there is the possibility of Less rain fall and chances of drought increase.

(ii) Establishment of factories cause checking of free air and ventilation in the environment and thereby cause of increase of excessive heat which ultimately lead to drought. Towns, houses and buildings, mainly built-up of bricks, wood and rocks, are increasing day-by-day is a man it made cause of drought.

Effect of drought on environment :-

Everybody wants to live in a healthy and peaceful environment. But the effects of drought hamper the salubrious atmosphere.

(a) Effect on vegetation :-

Due to scarcity of water vegetation completely dries up. As a result due to the loss of leaves, the process of photosynthesis suffers a lot. Rate of dormancy is also lessened.

(b) Effect on animals :-

In acute drought areas—

(i) There is a severe want of water and thousands of animals die. In the global scenario many big animals like lions, elephants, zebras are eliminated due to this type of severe drought.

(ii) Many herbivorous animals also vanish every year in these types of acute drought-prone areas. In India, instances are not very rare when such animals die in Rajasthan (Thar desert), Kalahandi, Sambalpur and some other places.

(c) ***Effect on human society*** :-

(i) In drought condition Ponds, canals, bills, hills dry up. As a result, there is a scarcity of drinking water and water for domestic purposes.

(ii) As the water-levels come to the lowest strata the irrigation of fields suffer a lot.

(iii) It is to be noted that famines appear in the wake of drought.

(iv) Innumerable people, mostly children and aged people, die for either want of nutrition or of food.

(v) Due to scarcity of water, progress of cultivation is hampered. Generally people are subject to acute distress.

(d) ***Effect on environment*** :-

(i) Ecological balance and equilibrium of environment is disturbed.

(ii) Food chain of the ecosystem is disrupted.

(iii) In drought-like condition desert and desertic condition of the land may be extended which is *technically known* as 'Desertification'.

2. Flood

Due to heavy and continuous rainfall when excess water of the rivers inundates both the banks of the river, flood occurs. Flood does enormous damage to man. Due to flood the environment becomes dirty and polluted. We call the occurrance of flood a natural calamity though both nature and man are responsible for the flood.

(a) Causes of Flood : The causes of flood are as follows :

(1) Intensity of Rainfall in catchment area : The intensity of rainfall in the catchment area is the main cause of the flood. If the rainfall is normal and the duration of the storm is short, then the surface run-off will flow down smoothly through the tributaries and rivers will not create any trouble to the downstream tide.

(b) Topography of the catchment : The catchment area with steep slope increases the run-off and increases the sediment in flow due to the high velocity of flow.

(c) Sedimentation of Rivers : If the tributaries of a river carry heavy sediment-load the river bed goes on silting up gradually every year. Thus, the carrying capacity of the river goes on reducing every year.

(4) Obstruction in the River Flow : In hilly catchment area, sometimes it may happen that the debries from the landslides may form an obstruction in the river valley like a dam, and thus a reservoir may be formed on the downstream side.

(5) Contraction of River Section : While constructing road or railway bridges ross a river, the approach works are done on both banks so that the cross-section he river is reduced.

(6) Inadequate Cross Drainge Works : In cross drainage works like aqueduct the river passes below the canal. Here, the structure which is constructed for the smooth running of the river water may be inadequate for the high flood discharge.

Effects of Flood : The following are the ill effects of flood :

(1) Damage of Property : When the villages or towns are submerged under considerable depth of water with high velocity of flow, many houses may collapse, as well as furniture and other valuable things may get damaged.

(b) Loss of Life : If the high-velocity flood water suddenly submerges the inhabitant areas under great depth the loss of life (both human and cattle) is more.

(c) Waterlogging : The flood water may cause waterlogging in agricultural land making the soil alkaline in nature thereby reducing the yield of crop.

(4) Rise of Price of foodgrains : When the road and railway communication is disrupted due to damage by flood, the movement of the foodgrains and essential commodities is hampered.

(5) Disruption of Communication : Due to the flood the culverts or bridges on the road and railways may be damaged.

(6) Loss of Work : During flood all types of work such as building works, road works, agricultural works, etc. remain suspended.

Good effect : The only good effect of flood is that the agricultural land becomes enriched with silt which has got a good manure value and hence the yield of the crop becomes high.

(b) Methods of Flood Control : The following methods of flood control works are resorted to generally :

(1) Construction of check dam : The check-dams are constructed across the tributaries of river at suitable places near the confluence point.

(b) Construction of Contour Bunds or Terrace Bunds : In hilly catchment area, the contour bunds are constructed in rows at different elevations transverse to the slope.

(c) Construction of Flood Control Reservoirs : Flood control reservoirs are formed by constructing low dams at suitable places on the course of the river.

(4) Construction of Flood Walls : When no space is available for the construction of levee or when it is not suitable to construct the levee due to the site condition, the construction of flood walls are recommended.

(5) Construction of Diversion Channel : From the upstream side of the Flood-affected area a diversion channel is excavated to connect the river with a large lake or bil (marshy land).

(6) **The construction of flood ways** : The low-lying areas along the cr river are known as flood ways. During the flood, the river water may be diverted to flood ways by artificial channel.

Conflicts over water :

97% of total water is saline water. About 3% water is considered as sweet water but third of that water is in the form of ice. Therefore we can use only 1% water in the of ground water and surface water. But the demand of water is rapidly increasing in resp to the civilization. The critical situation due to scarcity of water leads to war between ma countries in Africa. The earth is facing a lot of conflicts over water. The cause for th conflicts are-

Most of the water resources on the earth is not usable by human being. Neadly 97 cent of water on earth is saline and only 3.0 per cent of water is available as fresh wa Again, out of this fresh water nearly 97 per cent is stored as ground water and a very sm percentige (0.3 percent) flows through the river and serve as the principal source of wa for human use. Throughout the century there has been a continuous decline in availab of fresh water to meet up the demand of rapid increase of population. The withdra of ground water has been tripled during the period of last five years. Excessive extrac of ground water result in the drop of water table to more than 30 metres in the l 40 years.

Conflicts over water in India :

Though the UN has declared the year 2008 as the **International sanitation year.** S many conflicts over water in India are going on.

International Conflict : Conflicts between Bangladesh and India regardi distribution of water of **'Ganga'** throu **'Farakka Barrage'**.

Inter-State Conflicts :

(i) Conflicts between Karnataka an Tamilnadu over water of the rive 'Kaberi'.

(ii) Conflicts between Gujrat, Maharasht and Madhya Pradesh over **'Sarda Sarobar dam'** on the river Narmada i Gujrat.

(iii) Satadru-Jamuna conflict is going o between Punjab & Hariyana.

Benefits of Dams

(i) Flood of a particular region may be partially controlled.

(ii) People will enjoy the benefit of irrigation from the dam.

(iii) Hydro-electric Project may be developed with the dam.

(iv) The dam may be used for fishery.

(v) The spot may be treated as a tourist spot (Exp. Brindaban garden) Hirakund, Bhakra-Nangal etc.)

Problems with dams.

(i) Many people would become homeless.

(ii) The ecology of the area would be disturbed.

(iii) Hectares of forest and cultivated lands would be immersed.

(iv) Possibilities of soil-erosion, landslide and loss of bio-diversity.

(v) Problem of Tribal displacement as many people would become refugee.

3.9 SOIL EROSION

Some of the natural and man-made causes which make the soil weak and render the soil erodable are excessive grazing of animals, cultivation, deforestation, flowing of river, rainwater and high velocity of wind.

(A) Natural causes of soil erosion :

(i) **Steep slope** : In the hilly regions, the rainwater of heavy rainfall washes the soil to a great extent.

(ii) **Loose soil** : Due to absence of sticky substance, soil erosion becomes very easy. It is found in the Sea-coast, near the desert that slopes of the plateau become vulnerable and soil erosion starts in an unabated way. As the percentage of sand is great in these soil, there is looseness of soil

(iii) **Scanty vegetation** : In the absence of good coverage of vegetation on the ground, rainwater, water of the river, waves of the ocean and heavy blowing of wind cause enormous damage to the soil and naturally, there is a good amount of soil erosion.

(B) Man-made causes of soil erosion :

(i) **Uncontrollable management of cattle** : Due to over-grazing, in the hilly area the grass carpets become completely denudated, hence excessive soil erosion occurs.

(ii) **Defective irrigation system** : Unscientific and unplanning system of irrigation leads to deterioration of soil. As a result, the soil erosion takes place to a good degree.

(iii) **Excessive felling of trees** : Due to excessive felling of trees, the soil beco loose and soil erosion takes place very rapidly.

(iv) **Unscientific utilisation of land** : Right land should be utilized for right typ cultivation. Deviation from this idea leads to soil erosion.

(v) **Jhum cultivation** : In the hilly regions, in slopes, if the steps are not made prop according to the contour of the land then due to rain water or rainfall, there is a g amount of soil erosion.

An International Soil Statistical Institute has of late reported that every year thousa of tonnes of soils of the world are getting unfertilised and are cosing their qualities.

Effects of soil erosion on environment

(a) *On natural environment*

(i) Soil gives nutrition to plants. Soil is a pre-requistie for the growth of vegeta Naturally, if there is a decrease of soil fertility, there is less vegetation.

Soil contains rainwater. A good amount of water evaporates from the soil due sunlight. This vapour ultimately condenses to help rainfall. So, if there is soil erosion, wa cycle is hampered.

(ii) There are many small holes in the soil. Soil is composed of clay, alluvial and ot particles. The water percolates through the holes/slits and the water strata are formed there is soil erosion, the terrestrial water level comes down.

(iii) Due to soil erosion, the navigability of rivers decrease, It ultimately leads to flo in many cases.

(iv) Due to erosion of soil, the wetlands lose their capacity of retaining the water to i fullest or maximum.

(v) Due to heavy soil erosion, the capacity of many wetland recedes.

(vi) The fungi, bacteria and other microbes, decompose the dead plants, animals an organic matters decayed materials. Those are stored inside the soil. So, if there is s erosion, the food chain is lost.

(b) *Effects of soil erosion on human environment*

(i) Due to soil erosion, men confront with more economic and social problems. Irrigati system is hampered specially.

(ii) Many of the ports face acute problems for maintaining navigation and th navigability of water is hampered to a great extent.

(iii) Due to soil erosion the ecosystem of wetland is disturbed. The urban areas a confronted with the risk of spreading epidemic of diseases. During the rainly seaso rainwater accumulates in the roads, streets, etc., and there is no proper drainage syste for the outlet of water.

(iv) Due to erosion of soil in the fertile land, cultivation gets suffered a lot.

(v) Due to soil erosion, together with rainwater soil comes to the river. It makes the rive unusable for boats and other water transport.

Types of soil erosion

(a) **Sheet erosion** : In rainy season due to excessive rainwater, the upper strata of the soil become some sort of the sheet of crust soil.

(b) **Rill erosion** : The rainwater makes some narrow long pits, which are not very deep.

(c) **Gully erosion** : When the Rill erosion due to rain makes some of the pits deep and long, which ultimately become gullies rainwater completely washes off the soil. It is called gully erosion.

Controlling methods of soil erosion

(i) Steps should be taken for shifting cultivation and stoppage of *Jhum* cultivation.

(ii) Emphasis should be given to creation of forestry or afforestation.

(iii) Control of cattle grazing.

(iv) Advance cultivation methods should be made according to the height of the land and new innovation of cultivation should be initiated in the hilly areas.

(v) To prevent soil erosion some sorts of barricade should be made like concrete-wall, log-wall, rock-wall, sandbags, etc.

3.10 DESERTIFICATION

Extension of the area of the desert is known as **desertification.** The 'Thar desert' of Rajasthan is the biggest desert in India.

The total area of the earth which are under desertification is about 20%.

Causes of Extension of the desert :

(i) Unscientific cultivation of land in the desert area.

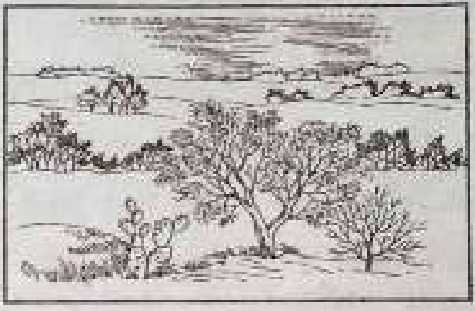
(ii) Existence of excessive grazing field or pasturage for cattle.

(iii) Excessive application of fertilizers and pesticides.

(iv) Unplanned felling of trees.

(v) Uncontrolled irrigation.

(vi) Unarable land under the aegis of cultivation.



Control of desertification

There is no definite system of control of desertification. The way global warming is increasing, the vicinity of the desert is also increasingly extended. Control of desert may be under taken or done to some extent by the implementation of the following steps :-

(a) Steps should be taken to control of grazing of cattle in the pasture land.

(b) Advance Scientific methods of cultivation alongwith drought-resistant variety of crops should be introduced.

(c) Adequate irrigation system should be initiated.

(d) Drought-resistant plants should be introduced.

(e) Proper landuse system should be made.

The Central Arid Zone Research Institute, Jodhpur (like Indian Council of Agricultu Research) is doing very useful work for the control of the desert, for the Prevention desertification and introduction of many useful crops in the agricultural section for benefit of the people.

3.11 Environmental changes caused by agriculture and over-grazing

There has been a steady increase in the demand for producing more food for growing population, fodder for livestock, firewood and industrial raw materials.

On the other hand, it is observed that the per capita land available has decreased almost half and is likely to decline further for all uses such as cultivation, grazing and fodd and also for meeting social priorities.

The introduction of high-yielding varieties changes the complexion of agriculture. Th environmental change has caused many pest problems and their numbers increase with irrigation, high use of fertilizers and introduction of high-yielding varieties. The use of high dosages of pesticides cause health hazards through the food-chains.

Intensive cultivation of land without conservation of soil fertility causes environmental degradation. Excessive irrigation is the cause of salinity of soil.

At present one-third of agricultural land is devoted to crops and the remaining two-third is devoted to pastures for livestock grazing. Over-grazing of all community lands has converted them into barren land.

3.12 Water-logging and Salinity :

Unscientific tapping of under-ground water would lead to quick exhausion of natural farming. Excessive tapping of under-ground water causes decline of groundwater level and also water-logging in the agricultural field.

Causes of Water-logging are :-

(i) Inadequate water drainage.

(ii) Seepage from canal system.

(iii) Over-irrigation of fields.

(iv) Obstruction of natural drainage.

(v) Obliteration of natural drainage.

(vi) Inadequate capacity for arterial drainage.

(vii) Construction of water reservoir.

(viii) Natural obstruction to the flow of groundwater.

Effects of Water-Logging :

(i) Inhibiting activity of soil bacteria.

(ii) Decrease in available capillary water.

(iii) Fall in soil temperature.

(iv) Defective air circulation.

(v) Rise of salt.

(vi) Delay in cultivational operation.

(vii) Growth of wild flora.

(viii) Adverse effect on community health.

Preventive Measures of Water-Logging :

(1) Contour bunds or terrace bunds : Along the slope of the hilly catchment area contour bunds or terrace bunds should be constructed at different levels. These bunds form the water pockets which arrest the sediments and serve as detention basins for the heavy run-off during the rainy season.

(2) Small dams : Small dams are constructed across the tributaries of a river and even on the river at the upstream region to form small reservoirs where sediments are arrested and the flood-water is detained.

(3) Soil conservation : The soil conservation methods should be adopted in the catchment area.

(4) Slip stabilisation : The slips or landslides in the catchment area should be detected and effective method should be employed to stabilise them.

(5) Control of cultivation in catchment area : Cultivation should be done in controlled way with shallow marginal bund along the bowvaary of specified land so that the loose soil is not washed out by rain-water and carried to the downstream area.

Curative Measures of water-logging :

(1) Remodelling work : The levelling should be done along the stream, nalla or khari and the excavation of these water ways should be done with proper depth and slope so that the water flows easily towards any river or other water course.

(2) Construction of water pockets : While remodelling the mater course or stream some deep excavations are made on the bed at some interval, along its course where small water pockets may develop.

(3) Diversion channel : The source of water flowing towards the low-lying area should be detected and diversion channel should be constructed to discharge water to the nearby river or any other water course.

(4) Link channel : The water accumulated in low-lying area may be discharged to large natural pond by constructing link channel after properly surveying the area.

(5) Construction of Sump well : Sump wells may be constructed at suitable places within the low lying area.

3.13 ENERGY RESOURCES

The energy resources which are extensively used for a long time for the production of energies in our daily life, are known as **conventional energy resources**.

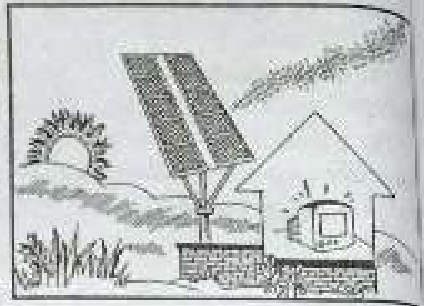
Eg. **Fossil fuel such as coal, petroleum etc. besides atomic energy, natural gas etc.**

These conventional energy resources are non renewable because these sources of energy cannot be replenished at all through natural cycles and may be exhausted in a few years.

The energy resources that are not extensively used for energy production in our daily life and do not cause any damage to our environment are known as non-conventional energy resources, eg. solar energy, wind energy, tidal energy, geo-thermal energy etc.

These energy resource are known as renewable resource because these sources of energy can be used continuously year after year and do not get exhausted in a few years and also can be replenished rapidly through natural cycle.

(i) Solar Energy :



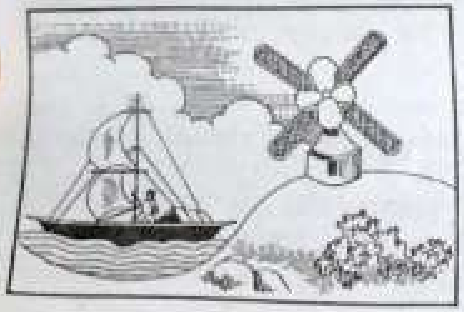
Sun is the source of almost all kind of energy on earth either directly or indirectly. Solar Energy may be used in various ways through different instruments.

The different instruments which use solar energy in various ways are given below.

(a) Solar thermal route :

Solar cell, Solar cooker, Solar air heater, Solar heater, Solar dryers, Solar distillation etc.

(b) Solar Photovoltaic route eg. street lighting, water pumping, solar lantern etc



(ii) Wind Energy :

The mechanical energy of wind speed can be converted into useful type of energies, mechanical or electrical. But for conversion of wind energy into electricity, higher wind speed (18—20 km/hr) is needed. An especially constructed generator is attached to the wheel of the wind-mill which generates electricity. It is eco-friendly or non polluting.

Applications : In draining lakes and marshes irrigation, grinding grains, and for many industrial uses like sawing timber, extracting oil from oil seeds, making wooden shingles, making paper, snuff, spice polishing stones etc.

(iii) Tidal Energy :

Tides are created by the gravitational attraction of the moon and the sun on the oceans of the rotating earth. The relative motions of these bodies cause the surface of the oceans to be raised and lowered at a periodic interval. The difference in level of water between high tide and low tide is utilised to produce hydro-electricity.

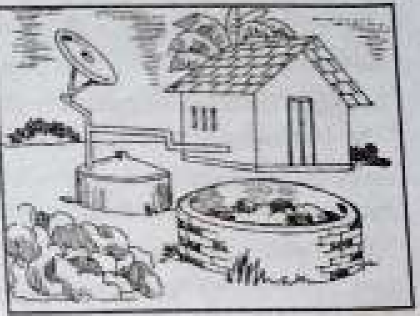
Mechanism of production of tidal energy : The water at a higher level is stored and allowed to fall on the lower level. By using a water turbine hydro-electricity is produced. The height of the turbine is shorter and somewhat different from other turbines used to generate electricity from other sources.

(iv) Geo-thermal Energy :

The inner core of the earth is hot and molten. Its temperature is about 4000°C. Geothermal energy is enormous. In some places near hot spring or volcanic region, hot conducting rocks are present. When water comes in contact with these hot rocks, they cause hot springs or geysers. To generate power by geothermal energy, water is sent through the pipes inside the earth's core, where water undergoes evaporation and the hot vapour comes out through the pipe. If a turbine is fixed in the pathway of the vapour, then the vapour pressure will rotate the turbine which generates electrical energy.

(v) Biomass Energy :

It is very cheap, pollution-free and rene-wable energy.



Biomass means the dry weight of organic matter produced by plants, their derivatives and wastes. They can be easily burnt and heat produced due to the process can be used in various ways.

(a) Sun is the primary source of almost all kind of energy on earth, either directly or indirectly. Only a part of the vast energy of the sun is received by the earth. The solar energy is essential for survival of living organisms on the earth.

(i) Solar energy is responsible for evaporation which in turn form the clouds and supply the mechanical energy of rains. Hydroelectricity depends upon the potential energy of water which again is dependent on solar radiation.

(ii) Plants produce food by photosynthesis. Plants store solar energy in the form of chemical energy (A.T.P.). All animals are dependent on the plant kingdom for nourishment directly or indirectly. The fossil fuels are created by solar energy.

(iii) Wind energy, tidal power, wave power depend on sun directly or indirectly.

(iv) Solar energy is used to generate electricity through Solar cell, Solar cooker, Solar heater etc.

(b) The use of solar energy means capturing it directly by using different methods.

Three Types : There are three main types of energy systems that use the sun's energy directly : passive, active and photovoltaic.

(i) **Passive heating and cooling** : This system uses the heat of the sun directly and this is the cheapest way of warming buildings. Under this system, the sun's energy is converted directly into heat for use at the place where it is collected.

(ii) **Active solar heating** : Under this heating system the sun's energy is converted into heat, but the heat must be transferred from the area to the place of use. Solar heat can also be used to generate electricity. Water can be heated by air and warm water can be used to produce steam that drives a steam turbine to generate electricity r.te eg. solar dryers, solar distillation.

(iii) **Solar (photovoltaic) cells** : Solar energy can be used to generate electricity which can be used to operate solar batteries or may be transmitted along normal transmission system like solar cells or photovoltaic cells which can convert solar energy directly into electricity. Solar cells, on the roof of huts in rural areas, also supply electricity. A solar cell can also be used as a battery charger that works merely by exposing it to light. Thus these cells are very useful for outdoor lighting.

Solar energy technology progress in India :

India has done a lot in adapting technologies for maximum use of solar energy through artificial devices.

(i) Even in remote Indian villages solar cookers, solar heaters, solar desalination plants, solar photovoltaic electric power generators and solar pump sets are being used.

(ii) DNES, Rural Electrification Corporation, various Indian Institutes of technology, Dept. of Metallurgy of Pune Eng. College are engaged in developing solar systems.

(iii) NCER (Dept. of non-conventional energy Resources) started working on solar energy in 1980 and has installed a number of solar photovoltaic systems throughout India.

(iv) A photovoltaic micro-irrigation pumpset is under use in Hissar.

(v) The first solar desalination plant was installed in Haryana.

(vi) Many big mills are using solar energy for space heating and water heating purposes.

3.14 Role of an individual in conservation of natural resources :

Role of an individual is very important in conservation of natural resources. At present man is realizing the necessity of preserving environment for the benefit of society of mankind. A man can use the natural resources in a scientific way. He can save water and can follow the sustainable developemnt process in every span of life including agriculture. But to follow the safe process he has to realise the importance of conservation of natural resources.

3.15 Importance of conservation of living and non-living resources :

(i) For our base necessities of life we are to depend entirely on plants and animals. We get our food, medicines, clothings, shelter, from the materials of our surrounding environment. We must realise the importance of conservation of resources. If there are any shortage of these essential commodities there would be disaster.

(ii) Natural resources like land, mineral, conventional energies are freely used for the development of human civilisation. These resources are very limited. Therefore conservation of the natural resources is very important for the next generation and so on.

(iii) Conservation of resources is necessary to maintain equilibrium in environment and ecosystem.

If we observe the development critically we may infer that the development of human civilisation is not environment-based.

Huge natural resources like iron ore, petroleum, coal are freely used for the development and to fulfil the extra demand of the over-population. These developments are not always judicious as the resources are very limited.

Man is not happy with the present socio-economic development. Water, air, land have been polluted due to the products and effluences of agriculture and industries. Forest reserves are getting smaller and smaller day by day. Greenhouse effect and the ozone hole is increasing. These are all possible obstacles for the development.

3.16 Sustainable Development :

Sustainable development is a new topic. From the very dawn of civilisation men have improved themselves slowly and steadily by virtue of their emperical experiences.

Production and extravagance for enjoyment of life have begun but they have no uniform development. Proper understanding and co-existance should be the basic concept or sustainable development.

"The sustainable development generally means that the present generation should meet up their demands without hindering the economic progress for the next generation."

Long term sustainable development should be planned meticulously to cope up with the state of present environment. The main goal of the topic should be to improve the socio-economic status of man by wiping out famine and unemployment and by introducing education and health schemes for all. For launching any development projects environment must not be disturbed under any circumstances. In 1980, an exhaustive report on world conservation strategy was published by IUCN in which 'sustainable development' was emphasized and in 1992 in Basundhara Conference (Reo-de-Janero, Brazil) an 'Agenda-21' was adopted for sustainable developement of the world.

M.C.Q.

1. **Which of the following bacteria can fix nitrogen?**
(a) *Nitrococcus* (b) *Nitrobacter* (c) *Azotobacter*

2. **Free-floating aquatic microscopic organisms are known as**
(a) Nekton (b) Plankton (c) Periphyton

3. **Bhopal gas disaster was caused by the gas**
(a) Methyl isocyanide (b) Methyl isocyanate (c) Chlorofluorocarbon

4. **Which of the following is not a micronutrient?**
(a) Chromium (b) Magnesium (c) Molybdenum

5. **Chipko Movement is the resurgence of ecological concern and took place in**
(a) Kumaon (b) Himachal (c) Tehri-Garhwal

6. **The Silent Valley Movement was organised by**
(a) Medha Patekar (b) Sundarlal Bahuguna
(c) Kerala Sastra Sahitya Parishad

7. **Which one of the following organs is affected by silicosis?**
(a) Heart (b) Lungs (c) Brain

8. **Lotic Water means**
(a) Lake water (b) Running water in rivers (c) Ocean water

9. **Activated Sludge is associated with**
(a) Air purification process (b) Waste water treatment
(c) Solid waste treatment

10. **Which one of the following is not related to acid rain?**
(a) Carbon monoxide (b) Sulphur dioxide (c) Oxides of Nitrogen

11. **SPM in air is measured by—**
(a) High volume sampler (b) Hygrometer (c) Barometer

12. **The Seismograph is used to measure the intensity of**
(a) Sea wave (b) Cyclone (c) Earthquake

13. **Photosynthesis is a major component in**
(a) Carbon cycle (b) Nitrogen cycle (c) Sulphur cycle

14. **Out of the following, which disease is not caused by bacteria?**
(a) Chicken-pox (b) Tuberculosis (c) Leprosy

15. ***'Sand fly' is responsible for***
(a) Plague (b) Amoebisis (c) Kala-azar

16. **The element responsible for 'Itai-itai' disease is**
(a) Mercury (b) Arsenic (c) Cadmium

17. **What percentage of it the geographical area of a country should be under forest cover?**
(a) 23% (b) 33% (c) 13%

18. **'Narmada Bachao' movement was orginased by–**
(a) Sundarlal Bahuguna (b) Medha Patekar (c) R. K. Pachauri

19. **The Silent Valley movement occurred in–**
(a) Uttarakhand (b) Gujarat (c) Kerala

20. **Plants tolerant to desert condition are–**
(a) Halophyte (b) Xerophyte (c) Hydrophyte.

21. **The Ramsar site of West Bengal is–**
(a) Sundarbans (b) Rabindra Sarovar (c) East Kolkata Wetland

22. **The number of biodiversity Hot-spot is in India is–**
(a) 2 (b) 3 (c) 4

23. **A climatic phenomenon where a mass of warm water moves along the Pacific Coast of South America is–**
(a) Tornado (b) Hurricane (c) El Nino

24. **Example of tropical Savanna Biome is–**
(a) Dooars (b) Grasslands of Australia (c) Terai

25. **Disease caused by protozoa is–**
(a) Bacillary dyssentry (b) Amoebiosis (c) Typhoid

26. **"Sardar Sarovar" dam is situated in–**
(a) Madhya Pradesh (b) Gujarat (c) Rajasthan

27. **The waterbody with very high nutrient content is known as—**
(a) Mesotrophic (b) Oligotrophic (c) Entrophic

28. **Which one is not a renewable energy source–**
(a) Geothermal energy (b) Solar energy (c) Fossil Fuel

29. **Montreal Protocol was made in order to reduce**
(a) Greenhouse gases (b) Ozone depleting chemicals
(c) Suspended particulate matter

30. ***El Nino* results in**
(a) Cold oceanic wave (b) Hot oceanic wave (c) Tsunami

31. **Which one of the following is not found in India?**
(a) Lion (b) Leopard (c) Cheetah

32. Control of pest population by natural predators, parasites or pathogens called

(a) Biological pest control (b) Integrated pest management

(c) Chemical pest control

33. Jim Corbett National Park is situated in

(a) Uttar Pradesh (b) Uttarkhand (c) Madhya Pradesh

34. Which of the following is not an organochlorine compound?

(a) Aldrin (b) Brine (c) Hexachlorobenzene

35. Chemical, physical or biological agents that cause birth defect are called

(a) Teratogen (b) Carcinogen (c) Mutagen

36. Confinement of species in a particular area is described as

(a) Endemic (b) Epidemic (c) Exotic

37. The term 'RAMSAR' is related to

(a) Forest ecosystem (b) Wetland ecosystem (c) Grassland ecosystem

38. Biogas is compsed of

(a) Only methane (b) Methane and Hydrogen

(c) Methane, Carbondioxide and other gases

39. Which Indian community follows the twenty-nine rules relating t sustaininable lifestyle?

(a) Jaroas (b) Bishnois (c) Santhals

40. The earliest continent was

(a) Laurasia (b) Pangaea (c) Gondwanaland

41. Examples of common animals in Savanna biome are

(a) Antelope, Cheeta, Zebra, Rabbit (b) Jerboas, Kangaroo, Jaguar, Hornbill

(c) Bear, Penguin, Wild Ass, Ostrich

42. The earth receives major energy from

(a) Sun (b) Moon (c) Mars

43. Example of epiphyte is

(a) Water chestnut (b) Dodder (c) Cactus

44. The book 'Silent Spring' was written by

(a) Rachel Carson (b) Charles Darwin (c) E. P. Odum

45. State-specific population density in India is highest in

(a) Kerala (b) West Bengal (c) Uttar Pradesh

46. Ostrich is found in

(a) Australia (b) South America (c) Africa

47. 'Neritic zone' is associated with

(a) River (b) Lake (c) Ocean

48. 'Archid' is a type of

(a) Xerophyte (b) Halophyte (c) Epiphyte

49. The bird 'Dodo' which had been extinct since 1681, inhabited

(a) Phillippines (b) Mauritius (c) West Indies

50. 'Minamata' disease is due to pollution by

(a) Cadmium (b) Lead (c) Mercury

51. 'Selva' is a tropical rainforest in

(a) South America (b) Mexico (c) Myanmar

52. Life originated on earth

(a) 2.5 billion year's ago (b) 3.5 billion years ago (c) 4.5 billion years ago

53. Which of the following is a micronutrient?

(a) Boron (b) Carbon (c) Molybdenum

54. Which of the following bacteria can fix nitrogen from air?

(a) Nitrococcus (b) Nitrobacter (c) Azotobacter

55. Chipco movement is the resurgence of ecological concern in

(a) Kumaon (b) Himachal (c) Tehri-Garwal

56. Bharat Stage-II is related to which of the following?

(a) Solid waste management (b) Automobile emission (c) Noise pollution

57. The Silent Valley movement was organised by

(a) Medha Patekar (b) Sundarlal Bahuguna

(c) Kerala Sashtra Sahitya Parishad

58. Use of the non-conventional sources of energy is

(a) Nuclear energy (b) Wind energy (c) Energy from fossil fuels

59. Lotic Water means

(a) Lake water (b) Running water in rivers (c) Ocean water

60. The scale that measures the magnitude of earthquake is

(a) Kelvin's scale (b) Farenheit scale (c) Richter scale

61. Organic matter is decomposed by

(a) Birds (b) Bacteria (c) Fish

62. Free-floating microscopic organisms are known as

(a) Nekton (b) Plankton (c) Periphyton

63. The Scale that measures the magnitude of earthquake is

(a) Kelvin scale (b) Farenheit scale (c) Richter scale

64. The word 'Xeric' mean—

(a) Hill environment (b) Desert environment (c) Mangrove area

65. Earthquake is measured by

(a) Barometer (b) Electromyograph (c) Siesmograph

66. Biological control refers to

(a) Control of an organism by another organism

(b) Control of an organism by using pesticides

(c) Control of organism by themselves

67. Lithosphere represent the earth's

(a) Water (b) Land (c) Air

68. Which among the following is a Producer?

(a) Sparrow (b) Lion (c) Phytoplankton

69. The source of oxygen in the atmosphere is due to

(a) Excretion (b) Respiration (c) Photosynthesis

70. The earth receives major energy from

(a) Sun (b) Moon (c) Mars

71. Dr Salim Ali is a renowned

(a) Herpetologist (b) Ornithologist (c) Entomologist

72. The speed of wind is measured by

(a) Anemometer (b) Hygrometer (c) Seismograph

73. The 'Dynamo' was discovered by :

(a) Michael Faraday (b) James Watt (c) Eli Whitney

74. Nearly 80% of total energy requirement is made by

(a) Wood (b) Wind (c) Fossil fuels

75. Kalapakkam is a

(a) Hydel power station (b) Nuclear power station (c) Thermal power station

76. The term 'RAMSAR' is related to

(a) Forest Ecosystem (b) Wetland Ecosystem (c) Grassland Ecosystem

77. 'Estuary' Is

(a) Inland Wetlend (b) Deforested Area (c) Coastal Wetland

78. India is a mega diversity country with

(a) 4 Ecological hotspots (b) 3 Ecological hospots (c) 2 Ecological hotspots

79. The permissible upper limit of Arsenic in water is

(a) 0.05 mg per litre (b) 0.005 mg per litre (c) 0.0005 mg per litre

80. An ecological thinking is that in which no particular importance is given to

(a) Social Ecology (b) Human Ecology (c) Deep Ecology

81. In atmosphere content of nitrogen is nearly

(a) 90 per cent (b) 80 per cent (c) 70 per cent

82. Poliomyelitis is an important

(a) Algal water-borne disease (b) Fungal water-borne disease

(c) Viral water-borne disease

83. The lowest layer of the atmosphere is

(a) Stratosphere (b) Ionosphere (c) Troposphere

84. The earliest continent was

(a) Pangaea (b) Laurasia (c) Gondwanaland

85. Which one of the following is not a fossil fuel?

(a) Coal (b) Wood (c) Petroleum

86. The minerals are resources of which type?

(a) Non renewable resources (b) Renewable resources (c) None of the above

87. Earth was originated approximately

(a) 10 billion years back (b) 2 billion years back (c) 5 billion years back

88. Which one of the following countries is knows as the land of monsoon?

(a) India (b) USA (c) Egypt

89. Which one of the following is not a renewable source of energy ?

(a) Wood (b) Wind power (c) Petrol

90. On earth autotrophic components can directly fix

(a) Light energy (b) Mechanical energy (c) Chemical energy

91. The region where life is found first in earth is called

(a) Biosphere (b) Hydrosphere (c) Atmosphere

92. An example of renewable and non-polluting source of energy is

(a) Biomass (b) Coal (c) Solar energy

93. Mineral resources are :

(a) Renewable (b) Non-renewable (c) None of the above items

ANSWERS

1.(c) Azotobacter 2.(b) Plankton 3.(b) Methyl isocyanate 4.(a) Chromium 5.(c) Tehri Garhwal 6.(c) Kerala Sashtra Sahitya Parishad 7.(b) Lungs 8. (b) Running water in rivers 9.(b) Waste water treatment 10.(a) Carbon monoxide 11.(a) High volume sampler 12.(c) Earthquake 13.(a) Carbon cycle 14.(a) Chicken pox 15.(c) Kala-azar 16.(c) Cadmium 17.(b) 33% 18.(b) Medha Patekar 19.(c) Kerala 20.(b) Xerophyte 21.(c) East Kolkata Wetland 22.(b) 3 23.(c) El Nino 24.(b) Grasslands of Australia 25.(b) Amoebiosis 26.(b) Gujarat 27.(c) Entrophic 28.(c) Fossil Fuel 29.(b) Ozone depleting chemicals 30.(b) Hot oceanic wave 31.(c) Cheetah 32.(a) Biological pest control 33.(b) Uttarakhand 34.(b) Brine 35.(c) Mutagen 36.(a) Endemic 37.(b) Wetland ecosystem 38.(c) Methane, Carbondioxide and other gases 39.(b) Bishnois 40.(b) Pangaea 41.(a) Antelope, Cheeta, Zebra, Rabbit 42.(a) Sun 43.(b) Doddas 44.(a) Rachel Carlson 45.(b) West Bengal 46.(c) Africa 47.(c) Ocean 48.(c) Epiphyte 49.(b) Mauritius 50.(c) Mercury 51.(a) South America 52.(c) 4.5 billion years ago 53.(c) Molybdenum 54.(c) Azotobacter 55.(c) Tehri-Garwal 56.(b) Automobile emission 57.(c) Kerala Sashtra Sahitya Parishad 58.(b) Wind energy 59.(b) Running water in rivers 60.(c) Richter scale 61.(b) Bacteria 62.(b) Plankton 63.(c) Richter scale 64.(b) Desert environment 65.(c) Siesmograph 66.(a) Control of an organism by another organism 67.(b) Land 68.(c) Phytoplankton 69.(c) Photosynthesis 70.(a) Sun 71.(b) Ornithologist 72.(a) Anemometer 73.(a) Michael Faraday 74.(c) Fossil fuels 75.(b) Nuclear power station 76.(b) Wetland Ecosystem 77.(c) Coastal Wetland 78.(b) 3 Ecological hotpots 79.(a) 0.05 mg per litre 80.(c) Deep Ecology 81.(b) 80 per cent 82.(c) Viral water-borne disease 83.(c) Troposphere 84.(a) Pangaea 85.(b) Wood 86.(a) Non-renewable resources 87.(c) 5 billion years back 88.(a) India 89.(c) Petrol 90.(a) Light energy 91.(b) Hydrosphere 92.(c) Solar energy 93.(b) Non-renewable

Fill up the blanks :

Q.1. ——is a renewable resource.
Ans. Solar energy.
Q.2. —— is a non-renewable natural resource.
Ans. Fossil fuel.
Q.3. —— is a renewable natural resource.
Ans. Solar energy.
Q.4. Flood is a——hazard.
Ans. natural.
Q.5. Heavy rain on vegetation free slopes causes——erosion.
Ans. soil.
Q.6. The main source of energy or pr paration of food in green plants is
Ans. Sun.

Q.7. The full from of W.W.F and IBWL are——and——.
Ans. World wild life Fund, Indian Board of wild life.
Q.8. E——I——A——.
Ans. Environment, Impact, Assesment.
Q.9. The area of forest & woodland is ___ % of total landmass of earth.
Ans. 27.
Q.10. The two main non-conventional energy sources are——and——.
Ans. Solar energy, Wind energy.
Q.11. Two imprtant mineral resources in West Bengal are——and —.
Ans. Manganese and coal
Q.12. W——W——F——.
Ans. World Wild Life Fund.
Q.13. The resources of the earth are——.
Ans. natural.
Q.14. Erosion cause——of land.
Ans. Pollution.
Q.15. Greening——environmental degradation.
Ans. Prevents.
Q.16. —— is the way of protecting soil erosion.
Ans. Afforestation
Q.17. Biogas is a——type of energy source.
Ans. Uncoventional
Q.18. Water is a——resource.
Ans. Renewable
Q.19. NTPC stands for——.
Ans. National Thermal Power Corporation.
Q.20. Sunlignt Can be converted into Electricity through——.
Ans. Photovoltaic cell.
Q.21. The PH of distiled water is——.
Aris. 7.0
Q.22. G ____ P ____ P ____.
Ans. Gross Primary Product.
Q.23. N—— P——P——
Ans. Net Primary Product.

Very Short Answer type Questions

Q.1. Give two examples of fossils fuels?
Ans. Coal & Petroleum.
Q.2. What is soil erosion?
Ans. 'Soil erosion' is the process of detachment of soil particles from the soil surface due to the action of water, wind and human activities and their transportation from one place to another.

Q.3. Name two thermal power plants of India.

Ans. Kolaghat (W.B.) & Faridabad (Hariyana)

Q.4. Name two Hydro-Electric Project in India.

Ans. DVC (Damodar Valley Corporation), Koshi (Bihar)

Q.5. Name two uses of solar energy.

Ans. Solar cooker Solar water heater, soi;n energy li; satellite and irrigation.

Q.6. Give two examples of pollution free non-conventional energy.

Ans. Solai energy and wind energy.

Q.7. What do you mean by the term Human resource ?

Ans. In the Biosphere, man is a special creature and is now controlling the Biosph men, living in the midst of nature, as eco-friendly members, are ex-plormg all possible w for sustainable development in all spheres of life. For this Human is Considered a resource.

Q.8. What types of coal are found in nature?

Ans. Five types : Peat, Lignite, Bituminous, Anthracite.Graphite.

Q.9. Write down the names of two thermal power ssations In west Beng

Ans. Kolaghat (Purba Midnapure), Bandel (I'coghly).

Q.10. Mention two uses of solar thermal energy.

Ans. Solar Cooker, Solar heater.

Q.11. Write the names of two main Components of 'Sinia' of ro stratification.

Ans. Silica and Magnesium.

Q.12. What is the main characteristic feature of deciduous forest.

Ans. The trees are liable to be shed at a certain period.

Q.13. Name two bio resources.

Ans. Fish, Honey bee (Honey, Wax)

Q.14. Mention some Non-Conventional sources of energy.

Ans. Solar energy, wind energy, tidal energy, Geothermal energy, ocean thermal ener Biomass energy.

Q.15. Name two thermal power plants of west Bengal.

Ans. Kolaghat, Bandsl.

Q.16. What do you mean by the term drought?

Ans. When the temperature of the climate of any place of tropical region is higher th normal, absence of rain for a largtime, which causes rise in evo-transpiation which in t effects the ground water table, the living creatures and agriculture suffer from water scar is know as drought. It is a natural calamity.

Q.17. Name different types of soil erosion.

Ans. Sheet erosion, Rill erosion and Gully erosion.

Q.18. Name two non-renewable biotic resources.

Ans. Coal, petroleum.

Q.19. What are different types of bioJic resources ?

Ans. Flora : Medicinal and aromatic plants, spices, oilseeds , fruits, legumes, cere millets. **Fauna** : Cattle, Sheep, Goat, Pigs, Poulry.

Q.20. Name two non—polluting renewable energy.

Ans. Solar energy, wind energy.

Q.21. What do you mean by fossil fuel?

Ans. Fuels like coal, petroleum, natural gas which are derived from dead animals, micro-organisms and plants burned deep under sediments millions of years ago are known as fossil fuel.

Short Type Question Answer

Q.1. What is biogas/Gobar gas?

Ans. The agricultural wastes, the waste product from human beings and domestic animals and other bio-degradable waste products can produce flammable gases (biogas) through bio-chemical reactions of decomposition. Bio-gas is a mixture of 56% methane and 40% carbon-di-oxide arid 4% mixture of H_2, H_2S and N_2. It is produced by digestion, pyrolysis and hydrogasification in a specific plant called as the Bio-gas plant. Bio gas is commonly called as Gobar Gas.

Q.2. What are Conventional (non-renewable) and non conventional (Renewable) energy sources ?

Ans. (*) Conventional sources of energy are those which have been in use since longtime and have become a convention. Exp. Fossil fuels like coal, Petroleum, natural gas etc. These non-renewable sources cause pollution. (*) The energy resources that are not extensively us'ed for energy production are known as non-conventional energy sources. These renewable sources are more or less pollution free, environmentally clean and socially acceptable. Exp. Solar energy, tidal energy, geo-thermal energy etc.

Q.3. What is wetland? site an example.

Ans. See very short type quesstion No. (82) example : Rabindrasarabar, (East kolkata), chilka (orissa), Renuka (Himachal Pradesh), Bhoje (M. P.) Kolkat (Manipur).

Q.4. What is Geo-thermal energy ?

Ans. The heat of the earth (under the surface) offers a large potential of alternate energy source.

The heated water or steam of the underground portion of the earth can be drilled into such formations to make the steam drive turbogenerators to produce electricity. Thes is type of energy (pollution free and renewable) is known as Geo thermal energy.

Q.5. Mention the causes of soil erosion.

Ans. Natural causes :

(i) Steep slope,

(ii) Loose soil,

(iii) Scanty vegetation.

Man-made causes :

(i) Uncontrolable management of cattle.

(ii) Defective irrigation system.

(iii) Excessive felling of trees.

(iv) Un scientific Utilisation of land.

(v) Shifting cultivation.

Q.6. What is biodiesel/Biofuel ?

Ans. Various form of solid biomass and petrocrops can be converted by various chem process into gaseous and liquid bio fuels of which ethanol is a factor. Vehicles are d in Brazil by ethanol as ethanol is often used as a close substitute of petrol or diesel. T type of fueles produced by plants and biomass are known as biodiesel.

Q.7. What ~~are~~ are petro crops ?

Ans. Some kind of plants which accumulate hydrocarbons in the form of alkenes a known as petrocrops. These plants are used as source of fuel In industries and automobi 'Jatropa' a plant is connected ~~as~~ with the production of bio ~~disel~~ diesel. So this plant can be trea as ~~petro~~ Petro crops.

Q.8. Where from do the carnivors get energy ?

Ans. By taking the herbivores as their food, carnivores indirectly depend upon the gr plants for their nutritions as because of the fact that the herbivores directly depend u the green plants.

Q.9. What is afforestation ?

Ans. 'Afforestation' means plantation of trees, establishment of a forest cover on la and raising on new forest as plant cover on an area which forest vegetation has always long been absent. The objective of it is to increase protective and productive output.

Q.10. What is Dam?

Ans. Dam is made on the river for stopping the flooded water which results in s erosion. Dames are constructed for irrigation, electric power generation and to cont flood.

Q.11. What is the impact of deforestation.

Ans. When forests are destroyed, ecological balance is disturbed. The impacts deforestation are—

(i) Soil erosion

(ii) Floods, droughts (due to addition sediment loan in the rivers).

(iii)-Reduction of agricultural production due to loss of fertile top soils.

(iv) Decrease in fooder production. Intensification of green house effects.

Q.12. What is biofuel and how does a biofuel plant work?

Ans. Various forms of solid biomass can be converted through chemical process b bacteria in to gaseous and liquid fuels. This type of fuels are known as biofuel. It is mixture of ethanol or methane gas and carbon dioxide.

It is produced by digestion or decomposition, pyrolysis and hydrogasificatipn of so biomass (animal wastes, agricultural residues etc.) in a specific digester 'digester' chamb of bio fuel plant.

Q.13. What is agroforestry?

Ans. Agroforestry refers to a mixed arable farming and forestry that has been practicise for a long time in many tropical area, especially in rain-forest environment.

Q.14. What is an estuary ?

Ans. The partially enclosed coastal area at the mouth of a river where its fresh water (mixed with silt) mixes with salty sea water is called an estuary.

Q.15. What is green energy ?

Ans. 'Green energy' refers to the energy or power generated from non-conventional sources so that no pollution is created, i, e, energy generated from Biomass, solar, tidal, wind etc.

Q.16. What do you mean by natural resource ?

Ans. The resource which is useful to living creatures and available in the environment is known as natural resource. Exp. water and sunlight.

Read the following passages carefully and darken the circle corresponding to the correct statement :

Passage-1

To initiate cultivation in nonfertile lands, to generate hydroelectricity and finally to improve the economic status, Gujrat and Madhya Pradesh governments have started Narmada Dam Project. This Project includes the construction of 30 large, 135 medium and 3000 small dams which will almost take 25 years with the expenditure of Rs. 40,000 crores for completion. Initially Baba Amte and then Medha Patekar have started a strong movement against this project. They opined that this project will cause complete inundation of 92 villages along with partial inundation of 294 villages and destruction of 55,000 hectre forestry.

Statement 1 : This project will include construction of 30 medium dams.

Statement 2 : Baba Amte is one of the initiator of Narmada Bachao Movement.

Statement 3 : The project is expected to destroy 55,000 hectre forestry.

Ans. ○ ● ●

1 2 3

Passage-2

Pure air appears to be colourless, odourless, and tasteless. The existence of air cannot be felt unless it is in motion. The other characteristics of air is its mobility, compressibility and expansionability. All such characteristics are important, as we find density of the air varying with altitude. The density of the air decreases with increasing altitude. So the air close to the earth's surface exerts more pressure. It can also transm compression waves such as sound waves. Air is transparent to many forms of radiation whereas some Green House Gases (GHGs) are not, otherwise the earth would have been turned into a frozen land surface. Air also forms a canopy in offering resistance to the objects like meteors which invade the atmosphere from the outer space. The meteors are destroyed through friction before they can reach the earth's surface. Without the air there would have been no clouds, winds, storms and better to say no generation of weather systems. As a result there could not be any life-form on earth's surface. The envelope of air protects the life-forms as a shield form the ultraviole radiation of the sun. It is the unique feature of our living planet.

Statement 1 : Atmosphere is one of the important support system of life on earth.

Statement 2 : Air pressure is the highest under the surface of the earth.

Statement 3 : We can hear sound in our ear through air medium.

Ans. ● ○ ●
1 2 3

Unit 4

Biodiversity and its Conservation

4.1 INTRODUCTION :

The word Biodiversity was first coined by Walter Rosen in 1986. The world is very rich in flora and fauna. The diversity of life is expressed in terms of biological diversity. Biodiversity is the total variety of life forms on the earth's surface. It refers to the sum total of varities of species–microbes, plants insects, amphibians, reptiles, birds and mammals which are found in the biosphere and associated with the ecosystem.

DEFINITION :

Total flora and faunal composition including genetic variation of an area is known as biodiversity.

4.2 IMPORTENCE OF BIODIVERSITY :

(i) Biodiversity is an imperative necessity for human race and society. We are to depend entirely on plants and animals for our base necessities of life. We get our food, medicines, biochemicals, clothings, shelter from the materials of our surrounding environment. We must realise the importance for our own interest as the shortage of the essential commodities would create disaster.

(ii) The energy which sustains human life is produced entirely by plants through photosynthesis. Energy is transferred from one trophic level to other at a diminishing rate.

(iii) Many of the medicinies come directly from different plants, fungi and bacteria.

(iv) Biodiversity is a pool of valuable genetic resource. Reduction in biological diversity results in adverse effect upon future breeding and improvement of species.

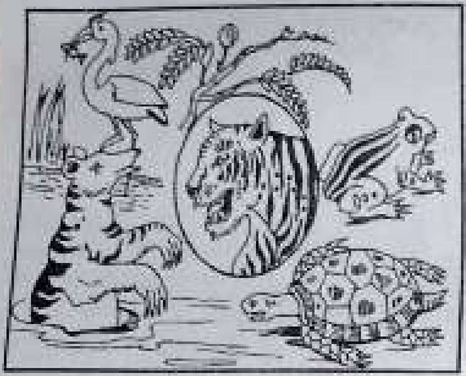
(v) As all species in a particular ecosystem live inter-dependently and loss of a particular species will disruptor break food chain or food web and disturb natural balance.

(vi) There is a close relationship between environmental pollution and community health. Due to air, water and soil pollutions in the environment, the community health will be disturbed. The conservation of biodiversity is the most important challenge of the present and immediate future for the benefit of the environmental and natural balan Thus conservation and wise management of biological diversity must get prop importance in our planning process and economic development must be based o ecological consideration.

4.3 THREE CONCEPTS OF BIODIVERSITY :

(i) Genetic Diversity (α-diversity) :

Amount of genetic variability among individuals of a single species.



Exp. *There are 50,000 quantities of Oryz Sativa & 200 varities of Mangifera Indica.*

(ii) Ecological Diversity (β-diversity) :

Variety of habitats (wetland, grassla forest, estuary, marine, aquatic, desert etc.) o an area indicates the ecological diversity.

(iii) Species Diversity (γ-diversity) :

Amount of all genetic variability amon different species. Species richness of an are depends on the number of varieties o different species.

4.4 BIOSPHERE AND ITS IMPORTANCE :

Biosphere means the part of the earth where life is found. Within ecosystem organisms, interact with one another and with their physical environment in various ways through predation, competition, parasitism, mutualism and commensalism. These relationships help organisms obtain the much-needed energy to keep themselves alive and to interact with their physical environment as they help circulate matter—such as water, oxygen, nitrogen, and carbon—through the ecosystem.

Humans, too, are part of the biosphere. However, many human activities like illegal dumping of wastes into oceans and other bodies of water, the burning of fossil fuels and the large-scale mining of minerals and other resources had a negative impact on the biosphere. It is now felt that we must conserve the biosphere's resources and coexist peacefully with other organisms in order to ensure the health and success of future generations.

Importance : The concept of biosphere reserves was evolved by the UNESCO under its Man and Biosphere (MAB) programme for achieving the following three objectives :

(i) To conserve for the present and future human use, the diversity and integrity of biotic communities within natural ecosystems and to safeguard the genetic diversity of species on which their continuing evolution depends.

(ii) To provide areas for ecological and environmental research, including particular baseline studies, both within and adjacent to these reserves, such research being consistent with the above discussion.

(iii) Finally, to provide facilities for education, research and training.

Functions : The theree functions of biosphere reserves are :

(a) Conservation of biodiversity and ecosystems ;

(b) Development association of environment ;

(c) Logistics—International network for research and monitoring.

To qualify for designation as a biosphere reserve, an area should normally be representative of a major biogeographic region, contain landscapes, ecosystems of animals and plant species of varieties which need to be conserved ; provide an opportunity to explore and demonstrate approaches to "sustainable development" within larger region where they are located ; have an appropriate zoning system, with a legally constituted core area devoted to long term protraction : a clearly identified buffer zone and an outer transition area.

The main functions of biosphere reserve are given below :

(i) To preserve the various living including the species which need to be conserved and non-living components of an ecosystem.

(ii) Utmost attempt to conserve the various genetic diversities of life.

(iii) Expansion of education about environment, ecosystem, conservation and uses.

(iv) Extension of research-work and training.

(v) Extension of local, national and international cooperation.

Biosphere reserve in India :

(i) Nilgiris (It covers part of Kerala, Karnataka and Tamilnadu)

(ii) Nanda Devi

(iii) Nokrek

(iv) Great Nikobar

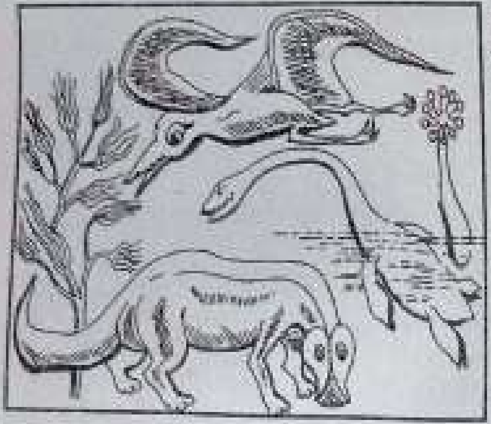
(v) Gulf of Manar

(vi) Manas

(vii) The Sundarbans

x4.5 ECOLOGICAL ROLE OF BIODIVERSITY :

The linkages between (a) bio-diversity and ecosystem structure and function (b) between different ways in which organism and population interact with each other and (c) to those community properties that emerge from such interactions, are old issues of ecological research and there are many postulations and concepts.



Many scientists believe that bio-diversity is essential for the proper functioning of communities and for the emergence of community level property. Just as many different DNA-encoded enzymes are needed for a complex organism to function, so scientists believe, many kinds of species are necessary to maintain community structure. Is any diversity is adequate or are any specific mixes of spp. are necessary for communities or ecosystem to function?

There are two views on this—

(a) The vegetation of an area is merely the resultant of two factors, the fluctuating and fortuitous immigration of plants and equally fluctuating and variable environment.

(b) In a fairly limited area only a fraction of forms that can do so theoretically actually form a community at any one time.

These two views are not irreconcible if communities can be defined as the sum total of all plants and animals that grow together in an area certain where pattern can be observed. Certain plants and animals can be expected in a particular environment (rainfall pattern, soil, altitude). Variability within a species seems to be important for long term survival. Community with higher species diversity may also cope with long-term environmental fluctuation better than community with few species.

x4.6 Human Being and Species Diversity

Apart from ethical or aesthetic reasons, is there any reason to fear that human survival is at risk if biodiversity is not preserved ? Can humans exist surrounded only by agricultural field, planted forest and like ? The question is not easy to answer. In short term, natural ecosystem can probably lose species without any great impairment of functions. For example planted forests are much more simple then natural forests they replace. As long as environment does not change very much ecosystem can apparently lose many of their rare species without any viable effect.

Yet environment changes invariably and sometimes drastically. It is then that the role of obscure species sometimes become very important. The continuation of life after extinction of the dinosores through an obscure species group known as mammals or the giant cycads and horse tail being replaced by obscure plant species which form today's angiosperms may be cited.

In modern days, humans seems to be on the verge of drastic changes of their own making — the result of global warming induced by carbon dioxide in the atmosphere.

The effect of industrialisation without ecological considerations may be catastrophic for many species which may become extinct. But a few species which is little known or of little use now may thrive in the new environment. Therein lies the importance of biodiversity, it increases the likelihood that at least some species will survive and give rise to new lineage that will replenish the Earth's biodiversity.

x4.7(A) Biodiversity Documentation

Biodiversity documentation means preparation of documentation towards counting and calculation of atmospheric green Thalophyta, herbs, shurbs, trees etc. together with animal kingdom in terms of Governmental records are regarded as biodiversity. As per wild life conservation act and laws all the properties of biodiversity can be protected from being stolen or destroyed. Till date, it is around 81,000 species of lives and 47,000 species of wood/greens have been recorded in India,

Till date, around 44 lakhs living organisms have been recorded in world among which plants are 2,50,000, insects 9,50,000 and mammals are only 45000 in numbers.[1]

Recorded No. of species (up to 1995),

Bacteria	4,000
Virus	4,000
Thalophyta (Algae)	40,000
Thalophyta (Fungi)	72,000
Protozoa	40,000
Plants (Herbs, shrubs & trees)	2,70,000
Insects	9.50,000
Mollusca	70,000
Mammals	45,000

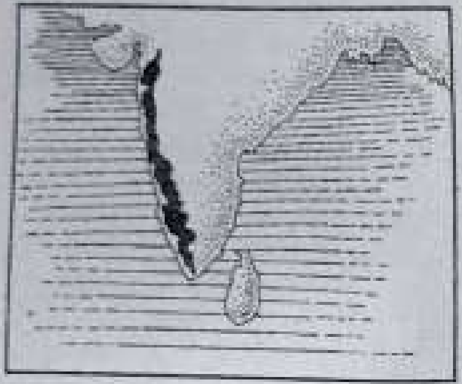
x4.7(B) INDIA AS A MEGADIVERSITY NATION :

India is a megediversity nation like Australia, Brazil, China, Indonesia, Madagascar, Philippines, Mexico, Peru etc. India has 49000 plant species and 89,000 animal species.

Among 15,000 flowering plants 4900 species of plants are endemic species. 6.4% of ar resource of the world is available in India. Due to favourable climatic condition geographical structure India is full of various biodiversity. There are lot of medicinal pl in our country. As per bio-geographical classification there are 10 areas like Th Himalayan Ladak, North-east Himalyan area, Thar and Run of Kachha, Desert of Pun Gujrat & Rajasthan, West-Ghat, Chotanagpur area, Ganges, Lakkhya island, Bramhap area, Andaman & Nikobar.

4.7(c) BIOSPHERE HOT SPOT :

Hot spots are those biospheres which contain exceptionally large number of endang species which are found nowhere (endemic species).



There are 25 hot spots in the world a India has 3 Biosphere Hot Spots-

(i) Western Ghat area [Rain forest : 7 amphibia and 62% reptiles are endemic]

(ii) East-Himalayan area.

[Important animal – Rhinoceros, Baba

(iii) Indo-Berma area (including Arunac Pradesh, Assam, Andaman, Nicober etc.)

[Important Species of Animal : Maca Bufoid

Some Critically endangered endemic species of India.

(i) Crocodura jenkensi
(ii) Biswamayopterus
(iii) Latidens salimali
(iv) Otomops wrough toni.

Endangered endemic species of India

(i) Macaca silenus
(ii) Crocidura andamanengis
(iii) Crocodura micobarica
(iv) Hemitragus hylocrius

Some Endangered Plants of India

(i) Heritiera minor
(ii) Ceriops roxburghiance
(iii) Nepenthes khasiana
(iv) Andrographis paniculata
(v) Rauvolfia serpentina.

4.8 GAIA HYPOTHESIS.

Ans. The GAIA Hypothesis is developed by James Lovelock, a British Biochemist. The hypothesis considers the whole biosphere of the earth as a single functional unit. In the Unit all the flora, fauna, biotic and abiotic factors act as a functioning whole in the development of a lasting environment that would preserve itself irrespective of anthropogenic activities and interferences. According to this hypothesis the human population of the earth should co-operate each other to save nature and to stop production of pollutants for the benefits of the living organisms. Conservation of biosphere and biodiversity will be possible, not by competition but by co-operation of the human beings of different countries. The hypothesis considers the whole biosphere of the world as a single ecosystem, therefore any disorders (natural or man-made i.e., anthropogenic) must effect the biosphere. On the basis of this hypothesis people of the whole biosphere should try to save the biosphere for the benefit of the present generation and the next.

4.9 Importance of Wild life Conservation

Conservation of wild life is very important and care to be taken against disappearing animals. The following points illustrate the importance of wild life :

(i) Ecological balance : Each species plays an important role in ecosystem by balancing the population, maintaining the food-chain and natural cycle on the Earth. They make the environment a self-sustaining system. Example–If the wild animal deer is removed from the food chain as shown below, grass will increase and lions will decrease.

Grass	—	Deer	—	Lion
(Producer)		(Herbivore)		(Carnivore)

It leads to ecological imbalance. Thus wild life is an important link in the food-chain in a terrestrial ecosystem.

(ii) Biological control : Wild life performs the function of biological control to keep a check on its animal and plant communities and their balance.

(iii) Survival value : The rich diversity of species surviving to day on the earth represent years of evolution which constitute a heritage to the past.

(iv) Scientific value : Wild life provides valuable information to naturalist in understanding the environment, ecology and behaviour of the animals. Various experiments of medical products are also done on these animals to study their impact on living organisms.

(v) Economic value : By selling animals and animal products a country may earn money, therefore wild species are economically important.

(vi) Genetic value : Wild life has a great value in breeding programmes in agriculture and animal husbandry etc.

(vii) Maintenance of natural cycle : Wild life maintains natural recycling of various organic and inorganic matters that keeps the soil fertile-.

(viii) Educative value : They have educative values for life science studies.

(ix) **Aesthetic and recreational value :** Wild life is a best source of recreation. Wild life has a great aesthetic and recreational value.

(x) **Medicinal value :** Many wild species have medicinal value but there are many varieties in the wild species whose medicinal importace is not known even today. Man is trying to explore the hidden value of some of these. It is a great loss to mankind if these plants or animals are lost before their importance is understood by man.

THREATS TO BIODIVERSITY :

The followings are the threats to biodiversity.

(1) Disturbance and Degradation—They are of two types, natural and man-made. Natural degradation are caused by spontaneous jungle fire, pest infestation, defoliation by locust attack, etc. Man-made disturbance and degradation are more severe. They include felling of trees, use of fire for clearing forest areas, collection of litter, and over-exploitation for other economically important products. Disturbance and degradation result in loss of biodiversity.

(2) Pollution— Excessive use of pesticides has polluted both ground water and surface water bodies. Sensitive species have disappeared. There is tendency of pesticide biomagnification which results in higher concentration with the rise in trophic level. It has resulted in drastic decline in the population of fish eating birds and falcons. Run off from fertiliser rich fields causes nutrient enrichment of water bodies. The phenomenon is called **eutrophication**. Sewage and other organic remains also result in entrophication. There is an additional dense growth of plants and animals followed by depletion of O_2 in death of animals and fouling of water. Lead and other types of heavy metals poured into water lead to mortality of many animals. Ducks, Swans and Cranes die of lead poisoning when they take in spent shot gun pellets falling into lakes and marshes. Lead poisoning from industries has killed many cattle drinking that water. Similarly, air pollutants cause death of sensitive plants. Radiations are harmful to both plants and animals. Spill-over of oil in sea causes death of several marine algae, and sea birds.

3. Over-exploitation— Excessive exploitation of a species, whether a plant or animal reduces size of population so that it becomes vulnerable to extinction, e.g., hunting of certain animals (now banned due to smaller number of the hunted animals), collection of medical plants.

4. Intensive Agriculture— Spread of agriculture is at the cost of wetlands, grasslands and forests. Destruction of habitats results in extinction of species. Intensive agriculture is also based on a few high yielding varieties. As a result there is reduction in the genetic diversity. It increases vulnerability of the crop plants to sudden attack by pathogens and pests. For example, at one time about 308 varieties of maize were growing in USA. Today their number is only 12. In Philippines, the number of Rice varities grown prior to 1970 was 3500. Their number has fallen to merely 5.

5. Forestry— There is a tendency to grow economically important trees in pure strands, e.g., Sal, Teak. It drives away or annihilates other species found in forests. The pure strands are liable to be attacked by insects and pathogens.

6. Introduction of Exotic Species— Non-native or alien species are often introduced for their economic and other uses. They often become invasive and drive away the local species. These species are considered to be second major cause of extinction of species (the first being habitat destruction). Exotic species have proved harmful to both aquatic and terrestrial ecosystems. Island ecosystems are the most vulnerable due to small size and small number of species.

(i) Water Hyacinth (*Eichhornia*) was introduced in Indian waters to reduce pollution. It has clogged water bodies including wetlands at many places resulting in death of several aquatic plants and animals.

(ii) Nile Perch (*Predator fish*) was introduced in lake Victoria of South Africa. It killed and eliminated several native species of small Cichlid Fish.

(iii) *Lantana camara* has replaced many species in forests of U.P. and *Eupatorium odoratom* has reduced the population of *Tectona grandis* in North-East. *Pathenium hysterophorus* has pushed out several herbs and shrubs from open places in the plains. In 1859, an Australian farmer imported 1 dozen pair of European rabbits for game. In six years the population was 22 million. In 1930, it was 750 million causing destruction of all types of vegetation.

7. Extinction of Species— It is the total elimination or dying out of species from the earth.

Susceptibility to Extinction— A species becomes prone to extinction due to two categories of attributes, drastic environmental changes and population characteristics. Population traits which makes species susceptible to extinction are–

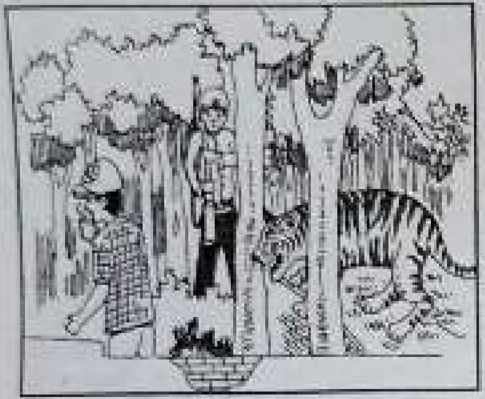
(i) Large body size e.g., Elephant, Rhinoceros, Bengal Tiger, Lion.
(ii) Small population size.
(iii) Low reproductive potential, e.g., Blue Whale, Giant Panda.
(iv) Higher status of trophic level, e.g., Bald Eagle, Bengal Tiger.
(v) Fixed Migratory Route and Habitat, Blue Whale, Whooping Crane,
(vi) Narrow Range distribution or small geographical range, e.g., Woodland Caribou,
(vii) Island species,
(viii) Lack of genetic variability, (ix) Inability to switch over to alternate foods.

4.10 Measures for Wild life Conservation

(i) Both central and State Govt. have to take new steps for establishment of national parks, wild life sanctuaries and reserve forests. Jaldapara Sanctuary is famous in West Bengal for the protection of rhinoceros, the Sundarban for tiger and Kaziranga of Assam for elephants.

(ii) In our country tiger project and crocodile project, bird sanctuaries are established for providing conservation and to increase the population of rare and endangered animals.

(iii) The Government of India formulated Wild life Conservation Act on 9th September, 1972 and declared that 41 varieties of large animals, 2 types of amphibians and reptiles and 18 types of birds are entirely protected by law.



(iv) Fishing, killing of animals and cutting of trees are totally prohibited inside the area marked for wild life conservation.

(v) Entrance to the reserve forest without permission is prohibited by legislation.

(vi) Water reservoirs, pond, ditches should be made in different places of forests for conservation of wild animals.

(vii) Propagation of different trees should be made inside different places of the parks, forests and sanctuaries.

(viii) Medical centres should be established in reserve forests, sanctuaries and national parks, for the treatment and protection of animals from various disease.

4.11 Conservation of Biodiversity

Despite many unanswered questions and unresolved issues, it is increasingly realised throughout the world that the conservation of biodiversity is among the most important challenges of the present and immediate future. Conservation of biodiversity and genetic resource is on the international agenda on conservation. India is having about the richest and most diverse heritage in the world and yet this heritage is now being threatened. Fortunately, this has been given due recognition in policy, programme and priorities of forests and wild life protection.

Conservation efforts can be grouped into two main categories (a) *in-situ* and (b) *ex-situ*.

In-situ conservation

This aims at maintenance of natural ecosystem in a man-made ecosystem in which they occur. The operative part consists of development of a comprehensive system of protected area (PA). These include creation of national parks, sanctuaries, nature reserves, host of conservation areas, biosphere reserves etc.

India at present has 66 national parks, 387 sanctuaries covering, 1,32,000 sq. km (15% of the total forest area) and 9 biosphere reserves. All these have specific conservation goals but are directed in general to maintain biodiversity including both genetic diversity as well as ecological diversity (spp richness).

Ex-situ conservation

This mainly relates to conservation outside their habitats by perpetuating sample population in genetic resource centres— zoo, botanical gardens, seed bank, tissue culture collection, etc.

Conservation and wise management of biological diversity must receive due importance in our planning process and economic development must be based on ecological consideration. Conservation, however, does not mean stoppage of any utilisation of biological resources but their management for benefit of all life including human kind of the biosphere, so that it may yield sustainable benefits to the present generation while maintaining its potential to meet the needs and aspirations of the future generation. The living resources are the biological capital available for human use and we should only use the interest only and not the capital. This is the core consideration for all conservation, biological diversity included.

4.12 IMPORTANCE OF WILD LIFE AND SANCTUARIES IN PRESERVING BIOLOGICAL DIVERSITY

Ans. Wild life includes plants and animals that live on land and in the watery areas of the Earth. Wild life is a significant part of our ecosystem, without wild life, human life are not possible. Wild life is the working network of organic existence on our planet. Wild life is important to human beings. Many wild plants yield new medicines and genes from wild plants can be used to improve existing crop plants by making them more disease-resistant and more productive.

Most sanctuaries are now under pressure due to illegal hunting and poaching. Many wild animals are facing extinction due to human activities.

At Orang National Pork, in 1999-2000 alone, five one-horned Asiatic rhinos were killed inside the park by the poachers.

Spread over nearly 80 square kilometres and the two districts of Darrang and Sonitpur on the north bank of the Brahmaputra, the sanctuary had 100 rhinos in 1991. By the 1994-95 census, the figure was 52, and the census last year (1999) found only 46.

Yet Orang was second only to the more famous Kaziranga National Park in terms of rhino population. Now it is in third position after Pobitora, which recorded 75 rhinos in the 1999 census.

Ironically, about 30 square kilometres of the sanctuary area has been encroached by many people have started living in the sanctuary area and little is being done to evict them.

Another favourite of wild life lovers is Manas Tiger Reserve. This is a happy hunting ground for the Bodo militant groups.

Declared a World Heritage Site some years ago, the reserve is now in danger. Union environment Ministry's employed para-military forces in Kaziranga and Manas.

The forces will combat both militancy and poaching and protect the park areas agai encroachment.

4.13 Three term to describe Wild life on the probability of extinction.

(i) **Critical Species** : 50% or greater probability of extinction within 5 years or wit two generations.

(ii) **Endangered Species** : 20% probability of extinction within 20 years or withi generations.

(iii) **Vulnerable Species** : 10% probability of extinction within 100 years'.

Central Govt. of India declared that 41 species of mammal, 18 species of bird, 2 typ of reptile and amphibia are entirely protected and conserved by Wild life Act 1971.

4.14 Some Important topics :

■ What is a threatened species?

The wild species that is still abundant in nature but is likely to become endange species because of a decreasing number is known as threatened species.

■ What is a K-selected Species?

K-selected species means a species which is adapted by natural selection to a livin a relatively constant population levels due to some special characteristics (i.e., eligible struggle for existence, slow rate of growth and development, long complete life cycle, lo generation gap, consume a little amount of energy for reproduction).

■ What is genetically modified organism?

The organism whose genetic make up or stucture has been modified by gen engineering to produce a better transgenic organism are known as genetically modifi organisms.

Exp. Mosquito has been modified due to introduction of GFP (Green Fluores Protein) into green eyed mosquito which is able to protect malaria.

■ What is Red Data Book?

In 1966, IUCN had published a book that list species at the risk of becoming extin This book is known as Red Data Book.

■ What is agroforestry?

Agroforestry refers to a mixed arable farming and forestry that has been practised a long time in many tropical area, especially in the rain-forest environment.

■ What is Green Data Book?

Green Data Book refers to a book which lists the measures of ecological conditio (forests, agriculture, biodiversity, pollution, water, energy etc.) of different countries.

4.15 Some In-situ Conservation

(i) **Sanctuary** : The protected area ranges from 0.61–7818 sq/km. though the boundary is not constant. Here Biotic interference is limited and scientific management is lacking. It is an area of the forest, which is declard by the forest authority with sanction from State Govt. in which killing, hunting, shooting or capturing of any animal is prohibited but research-work may be done with prior permission. Tourists and visitors are allowed with permission from forest department.

Exp. Kaziranga (Assam), Jaldapara (W.B.) etc.

(ii) **National Park** : The area ranges from 0.04 – 3162 sq. km. No biotic interference is allowed except in buffer zone. The national park is a vast area to conserve scenery, natural and historical objects and wild life therein and to provide for the enjoyment of these in such a manner by such means as will leave them unimpaired for the enjoyment of future generation.

Exp. Corbet National Park (U.P.), Hazaribagh National Park (Bihar), Kanha and Shibpuri National Park (M.P.).

(iii) **Reserved Forest** : The protected forest area where hunting of animals and cutting of tress are prohibited. The forest authority with sanction from State Govt. may declare any forest as reserved forest where due to poaching or other reasons the number of wild life gradually diminishes.

Exp. Garumara (WB)

4.16 Role of Man and Society to maintain Environmental Protection and Conservation of Biodiversity.

Man cannot live without environment and biodiversity. The equilibrium of environment and conservation of biodiversity is very important for the sustainable development and human civilization. People should understand and be aware about the adverse effects of environmental problem, loss of biodiversity and the steps to counter these problems. Society should adapt and establish rules, acts and culture for protection of environment and biodiversity. The members of the society should be aware about the relationship of man and nature.

An ideal state where everything is in equilibrium a balance of nature cannot exist, the weather changes constantly, diversity of plants and animals fluctuate, mountains erode, lakes and rivers get silted. Still the supporters of this notion hold that ecosystem are prevented to reach a state of balance due to exterior forces and are constantly moving towards equilibrium. In a system in a state of near equilibrium when the agent of disturbance is removed the system recovers and attains the pre-disturbed status. Therefore the role of man and society would be to avoid the exterior forces i.e., the disturbance which are the barriers for a system to reach the equilibrium state.

People indirectly change biodiversity by burning fossil fuel and biomass for fuel, b altering hydrological patterns intentionally and accidentally introducing exotics which m reduce interregional biodiversity, by destroying forest fringe, hedge rows and fallow la that provides habitat for the plants and animals. People should be aware and consciou about all these man-made activities and should take protection to conserve the nature a biodiversity. Society should avoid man-made disasters, production of pollutants for a water and soil.

Conservation and wise management of biological diversity must receive due importanc in our planning process and economic development must be based on ecologic consideration. Natural balance or equilibrium, conservation does not mean stoppage o any utilisation of biological resources but their management for benefit of all life includin humankind of the biosphere, so that it may yield sustainable benefits to the presen generation while maintaining its potential to meet the needs of the future generation.

M.C.Q.

1. **"Gaia hypothesis", which considers whole biosphere as a single functional unit, is devloped by**
   (a) R. Carson (b) J. Lovelock (c) E. Haeckel
2. **Which of the following are features of mangrove—**
   (a) Thick stem (b) Pneumatophores (c) More than one
3. **In dry tropical forest dominant plant species is—**
   (a) Acacia (b) Kejuarina (c) Palm
4. **Forestry week is—**
   (a) 2-8th Oct. (b) 14-20th July (c) 21-27th Oct.
5. **Wild life week is—**
   (a) 2-8th Oct. (b) 14-20th July (c) 21-27th Oct
6. **International Biodiversity day is observed on—**
   (a) 1st Nov. (b) 29th Dec. (c) 18th Feb.
7. **One of the article on environmental protection in Indian Constitution—, dealing with fundamental duty is :—**
   (a) Article 48A (b) Article 50A (c) Article 230
8. **The process that separate is varieties into distinct units are known as-**
   (a) Variation (b) Speciation (c) Specification
9. **Confinement of species in a particular area is described as**
   (a) Endemic (b) Epidemic (c) Exotic

10. **Which one of the following is not found in India?**
    (a) Lion (b) Leopard (c) Cheetah
11. **Jim Corbett National Park is situated in**
    (a) Uttar Pradesh (b) Uttarakhand (c) Madhya Pradesh
12. **Joint Forest Management was initiated in India at**
    (a) Chattisgarh (b) Uttaranchal (c) West Bengal
13. **Loktak lake, one of the most vulnerable wetlands in India is situated in**
    (a) Manipur (b) Tripura (c) Meghalaya
14. **Biomes are recognized by their types of**
    (a) Dominant Vegetation (b) Dominant Wild Life (c) Dominant Population
15. **Jaldapara National Park is in**
    (a) Assam (b) West Bengal (c) Orissa
16. **Arundhati Roy is associated with**
    (a) Chipko movement (b) Progressive Indian Film movement
    (c) Narmada Bachao Andolan
17. **Aggregation of organisms of different populations refers to**
    (a) Density (b) Diversity (c) Population
18. **Biodiversity means :**
    (a) Various kinds of animals (b) Various kinds of plants
    (c) Various kinds of biota
19. **What is the name of the supercontinent that broke into the present day continents?**
    (a) Galapagos (b) Gandowanaland (c) Pangaea
20. **Genetic deversity is also referred to as**
    (a) α diversity (b) β diversity (c) γ diversity
21. **Rachel Carson wrote the following book**
    (a) Silent Spring (b) The fall of the Sparrow (c) Human Zoo
22. **Charles Darwin was**
    (a) Mathematician (b) Linguist (c) Evolutionist
23. **'Ecosystem diversity' is also referred to as**
    (a) α diversity (b) β diversity (c) γ diversity
24. **Jaldapara is famous for the conservation of**
    (a) Tiger (b) Rhinoceros (c) Elephant
25. **Besides Sundarban, the other tiger project in West Bengal is located in**
    (a) Buxa (b) Jaldapara (c) Garumara

26. Collectively Sundarban is a—
(a) Sanctuary (b) Biosphere reserve (c) Protected forest

27. Who precisely defined ecology?
(a) Aristotle (b) Darwin (c) Haeckel

28. Lichen is an example of—
(a) Neutralism (b) Mutualism (c) Commensalism

29. Which of the following is a parasite-
(a) Hook worm (b) Penicillin (c) Cockroach

30. The production of such substances by organism, which are harmfu others is known as-
(a) Antibiosis (b) Fungicide (c) Symbiosis

31. Sunderlal Bahuguna is associated with which movement—
(a) Chipko movement (b) Tehri Garhwal (c) All the above

32. Green Bench in Calcutta started functioning from—
(a) June 1996 (b) Dec. 1998 (c) March 1999

33. Envis is related with—
(a) Environment conservation (b) Environmental Information
(c) Environment pollution

34. Three-mile island, the site of nuclear reactor accident in 1979, situated in
(a) USA (b) Russia (c) France

35. In Western Himalayas the nature of forests are-
(a) Tropical forest (b) Dry tropical forest (c) Temperate forest

36. Which of the following is a biosphere reserve-
(a) Nilgiri (b) Sundarbans (c) All

37. Zooplanktons are regarded as
(a) Producers (b) Consumers (c) Decomposers

38. Solid wastes of Kolkata Municipal area deposited at-
(a) Howrah (b) Dhapa (c) Baranagar

39. Number of national parks in India is—
(a) 66 (b) 32 (c) 102

40. Number of sanctuaries in India is—
(a) 400 (b) 387 (c) 66

41. One of the 'Hot Spot' of India is—
(a) Western Ghat (b) Sundarban (c) Manas

42. Earth Day is observed on—
(a) 11th July (b) 16th June (c) 22nd April

43. Population Day is observed on—
(a) 11th July (b) 31st May (c) 23rd March

44. Ecology Day is observed on—
(a) 31st May (b) 1st November (c) 18th February

45. Number of Hot Spot in India —
(a) 3 (b) 2 (c) 1

46. Kanha of U.P. is a
(a) Reserve forest (b) National park (c) Sanctuary

47. Which of the following is an example of in-situ conservation—
(a) National Parks (b) Sanctuaries (c) All the above

48. Which of the following is Wetland Day—
(a) 11th July (b) 16th June (c) 5th June

49. Kaziranga of Assam is a—
(a) Sanctuary (b) National Park (c) Reserve Forest

ANSWERS

1.(b) J. Lovelock 2.(b) Pneumatophores 3.(a) Acacia 4.(b) 14-20th July 5.(a) 2-8th Oct. 6.(b) 29th Dec. 7.(a) Article 48A 8.(b) Speciation 9.(a) Endemic 10.(c) Cheetah 11.(b) Uttarakhand 12.(c) West Bengal 13.(a) Manipur 14.(a) Dominant Vegetation 15.(b) West Bengal 16.(c) Narmada Bachao Andolan 17.(b) Diversity 18.(c) Various kinds of biota 19.(c) Pangaea 20.(a) α diversity 21.(a) Silent Spring 22.(c) Evolutionist 23.(b) β diversity 24.(b) Rhinoceros 25.(a) Buxa 26.(b) Biosphere reserve 27.(c) Haeckel 28.(b) Mutualism 29.(a) Hook worm 30.(a) Antibiosis 31.(c) All the above 32.(a) June 1996 33.(b) Environmental Information 34.(a) USA 35.(c) Temperate forest 36.(c) All 37.(b) Consumers 38.(b) Dhapa 39.(a) 66 40.(b) 387 41.(a) Western Ghat 42.(c) 22nd April 43.(a) 11th July 44.(b) 1st November 45.(a) 3 46.(b) National Park 47.(c) All the above 48.(b) 16th June 49.(a) Sanctuary.

Fill up the blanks :

Q.1. I. B. W. L. stands for———.
Ans. Indian Board of wild Life.

Q.2. Chipco is the movement for saving———.
Ans. forest.

Q.3. 'Babla'tree is a type of phyte———
Ans. Xerophyte.

Q.4. ———and———are two endangered animal species.
Ans. Indian Tiger, Rhinoceros.

Q.5. Corbet and Kanha National Park art located in———and———.
Ans. U.P. and M.P.

Q.6. Equilibium of species as disturbed by selected———.
Ans. Grazing.

Q.7. The names of two endangered mammals in India are——and —.

Ans. tiger, one horned rhinoceros

Q.8. There are _____ hot spots present in India.

Ans. 4 (Four)

Q.9. IUCN had published a book that list species at the risk of becoming extinct is known as _______.

Ans. Red Data Book.

Q.10. _____ refers to a book which lists the measures of ecological conditions of different countries.

Ans. Green Data Book

Q.11. Jaldapara is a ______ of W.B.

Ans. Sanctuary

Q.12. _____ of Assam is a Sanctuary for one-horned Rhinoceros.

Ans. Kaziranga

Q.13. Kanha is a National Park of ______.

Ans. Madhya Pradesh.

Q.14. ______ is a Reserved forest of W.B.

Ans. Garumara

Q.15. Genetic Diversity is also referred to as _____.

Ans. α-diversity.

Q.16. _______ is an example of exotic species.

Ans. Lantana Camara

Q.17. Full form of MABP is ________.

Ans. Man and Biosphere Programme.

Q.18. Biodiversity Law was established in the year ______.

Ans. 2002.

Very Short Answer type Questions

Q.1. What are the present day number of sanctuaries in India.

Ans. 421

Q.2. What is bio-diversity?

Ans. Bio-diversity is the total variety of life forms (Flora and Fauna) on the earth which are found in the biosphere and associated with the ecosystem.

Q.3. Where the earth summit was held ?

Ans. Rio de Janeiro, June 1992

Q.4. Write down the name of an endangered species (Plant or animal).

Ans. Chinkara Deer, Iquana [Animal) Blue Vanda (Vanda caerulia), Aloe vera (Plant)

Q.5. What is biosphere ?

Ans. Biosphere means the part of the earth in which life exists. All the animals and plants live on the earth's surface or close to the surface underwater, underground or in the atmosphere. The region where life is found is known as biosphere.

Q.6. Name any two areas of the Tundra Biomes.

Ans. Coastal strip of Greenland, the northern part of Canada and Alaska, northern Scandinavia and Siberia.

Q.7. Name any two areas of wetland of west Bengal.

Ans. Rabindra Sarobar, East Kolkata and Berhampore.

Q.8. Name two Places in West Bengal where deer sanctury is situated.

Ans. Chapramari (Jalpaiguri), Jaidapara (Jalpaiguii)

Short Type Question Answer

Q.1. What is wetland? site an example.

Ans. See very short type question No. (82) example : Rabindrasarabar, (East Kolkata), Chilka (orissa), Renuka (Himachal Pradesh), Bhoje (M. P.) Kolkai (Monipur).

Q.2. What is Sanctuary or wild life Sanctuary, Reserve forest and National Park?

Ans. The forest area where killing and capturing of any species of animal or bird is prohibited and whose boundary should be sacroscant as far as possible except under the order of the competent authority is regarded as **sanctuary.**

Exp. Sundarban. Jakdapara (W. B.)

The Reserve forest is an area under the control of state govt. Where killing of any species and entrance of general people is strictly prohibited except research work under proper permission of the competent authority Exp. Garumara, chapramari (W. B.).

The National park is a large forest area under the control of Central Govt. Where catching of fishes, cutting of trees, killing of any species of animals and entrance inside the area without proper permission is strictly prohibited.

Exp. Hajaribagh (Jharkhand) Kanha (M.P.).

Q.3. What is Ecotone?

Ans. Trasnsilion zone between two diveise communities called Ecotone. Exp. The tundra-boreal forest Ecotone.

Q.4. What is 'Ecotype'?

Ans. A subspecies or race that is especially adapted to a particular environmental conditions is known as ecotype. 2001

Q.5. What is an ecocity?

Ans. 'Ecocity' is a hypothetical term refering to a manmade city that would 'no waste' city where all the characteristics of an ecosystem are found. The city would convert its garbage, wastes and pollutants into harmless and useful substances for irrigation and other beneficial purposes.

Q.6. Name four common water brids.

Ans. Ducks, Pond Heron, cranes, penguin, cormorant.

Q.7. What is Biopiracy ?

Ans. 'Biopiracy' is an unethical transanction of live materials. Biopiracy is the illegal piracy of animals, plants, and microbes of their genetic material from one country to an another without having any legal documentation and denying the stakes of local users.

Q.8. What is an Elephant corridor?

Ans. The corridor which is used by the elephants during their migration from one habitat to other and which satisfies their foraging behaviour.

Q.9. What is radiotraking of an animal?

Ans. The traking system (with the help electronic instrument) of any specific animal (mainly the higher vertebrates) for their behaviour and ecological studies is known as 'radio traking of an animal'.

Q.10. What is coral reef ? Why coral reefs are very rich in biodiversity?

Ans. Coral reef' means a reef or Islands made up of hard substances growing on the bottom of the sea (In the Indian ocean and Pacific Ocean) by a small sea animal, which is now called the Polyp (Coralium rubrum), the stone like structures that polyps build around themselves remain after the polyps die. Coral reefs are very rich in biodiversity due to —

(i) Supply of foods,
(ii) Advantage of self protection,
(iii) Plenty of sunlight,
(iv) Safe place to live within heavy water current of the sea.

Q.11. What is genetically modified organism?

Ans. The organism whose genetic make up or stucture has been modified by genetic engineering to produce a better transgenic organism are known as genetically modified organisms.

Exp. Mosquito has been modified due to introduction of GFP (Green fLurocent Protein) into green eyed mosquito which is able to protect malaria.

Q.12. What is red data Book ?

Ans. In 1966, IUCN had published a book that list species at the risk of becoming extint. This book is known as Red data book.

Q.13. What is green data Book ?

Ans. Green data book refers to a book which list the measures of ecological conditions (forests, agriculture, biodiversity, pollution, water, energy etc.) of different countries.

Q.14. What is an estuary?

Ans. The partially enclosed coastal area at the mouth of a river where its fresh water (mixed with silt) mixes with salty sea water is called an estuary.

Q.15. What is a biosphere reserve ?

Ans. Biosphere reserve is attached to the conservation of whole ecosystem i.e not a particular species (like Jaldapara, sundarban).

Biosphere reserve means a large biosphere unit for the conservation of all the living organisms taking human need into consideration.

Q.16. What is an threatened species ?

Ans. The wild species that is still abundant in nature but is likely to become endangered species because of a decreasing number is known as threatned species.

Q.17. What is biodiversity documentastion?

Ans. Preparation of documentation towards counting and calculation of plant and animal kingdom in terms of Governmental records are regarded as biodiversity documentation. The aim of this documentation is to protect biodiversity from being stolen or destroyed. Till date it is around 45000 species of plants and 35000 speceis of animals have been recorded in India.

Q.18. What is Exsitu and 'Insitu' Conservation ?

Ans. Exsitu conservation relates to conservation outside the habitats of the plants and animals by perpetuating sample population in genetic resource centres (zoo, botamical gardens, seed bank, tissue culture collection etc).

Insitu conservation relates to the maintenance of natural ecosystem in a man made ecosystem in which they occur (creation of national park, sanctuaries, nature reserves).

Q.19. What is a wild life sanctuaivy ?

Ans. The wild life habitat which is free from human interferences and designated as a protected place where no adverse change is allowed to occur is known as 'wild life sanctuary'

Read the following passages (Small essays) carefully and darken the circle/circles corresponding to the correct statement of the respective passages.

Passage 1

The forests were considered as 'Banadevi' in other words the forests were given the status of goddess in ancient India. In many tribal areas of India there is a popular belief that the souls of their fore-fathers might live in some of the trees. Naturally God-fearing people had no courage to cut the trees or destroy the forests. Saints, Sages, Fakirs and Darbes used to live in forest and considered the forests, as Tapaban. In the spiritual and cultural life also, the role of plants and forests had an astonishing effect on the Indian people.

Also Leopold pointed out that not all humans have been considered to have inherent worth and intrinsic rights. In recent years these intrinsic rights have also been extended to include such entities as corporations, municipalities and nations.

Statement 1 : In ancient India the forests were given the status of goddess.

Statement 2 : Fakirs & Darbes considered the forests as Tapaban.

Statement 3 : God-fearing people are intersted to cut the trees.

Ans.	●	●	○
	1	2	3

Passage 2

The symbiotic relationship between environment and man can be traced back as early as the pre-historic period, more precisely during the Pleistocene Age, when the appearance of man took place in the form of Ape-man. A cursory study of classical literature like Rigveda and other similar works showed that the Aryans were very ardent and critical investigators of Indian plants and their proper utilisation. In the Manu-Sanhita and different Puranas and Tantras, it could be safely concluded, different elements of environment like soil, water, energy, air and sky were recognised. About the different constituents of environments, it was inter-alia conclusively proved in the Padma-Purana that if there were no inter-relationships among all the above cited five elements, the living beings of the planet would be on the point of extinction.

For maintaining equilibrium of the environment, the plants and forests have a great role, which was emphasised in the Bayu-Purana, that when people become greedy and cut plants and destroy forests ruthlessly, then the environment becomes polluted and natural calamities are bound to occur. Naturally, in ancient India, conservation of forests and trees were given utmost priority. For supplementing plants and forests, there were various ways and means in vogue which were roughly divided into two (i) conservation of forests and (ii) conservation of trees.

Statement 1 : Five important elements of the planet are Soil, Water, Sky, Industry & Forest.

Statement 2 : The relationship of environment and man is symbiotic.

Statement 3 : In ancient India conservation of forests were given utmost priority.

Ans. ○ ● ●
1 2 3

Unit 5
Environmental Pollution

5.1 DEFINITION :

Any change in physical, chemical or biological characteristics of the environment that has the potentiality to harm human life, life of other desirable species, natural resources, cultural assets and industries is known as Environmental Pollution.

5.2 CLASSIFICATION OF POLLUTION :

(a) **Natural pollution** is caused by natural sources, e.g., volcanic eruptions, release of methane by paddy fields, release of carbon monoxide by plants and animals, emission of natural gas, ozone, nitrogen oxides, cosmic rays, ultra-violet rays, etc.

(b) **Man-made or anthropogenic pollution** is pollution resulting from human activities like burning of fossil fuels, industrial effluents, pesticides, fertilizers, etc. Amount of man-made atmospheric pollution is hardly 0·05% of total pollution but it is more dangerous because of its concentration in certain localities.

On the basis of Physical Nature :

(i) Gaseous Pollution (ii) Dust Pollution (iii) Thermal Pollution (iv) Noise Pollution (v) Radioactive Pollution etc.

On the basis of emission of Pollution :

(i) **Point Source Pollution :** From a single point, e.g., chimney, municipal sewer.

(ii) **Line Source Pollution,** e.g., roads due to automobile exhausts.

(iii) **Area Source Pollution,** e.g., industrial estate.

(iv) **Diffuse Source Pollution :** Over a large area, e.g., sprayed pesticides or fertilizers through run-off.

(v) **Fixed Source Pollution.** Pollutants are passed from fixed spots as mineral smelters, electrical power plants.

(vi) **Mobile Source Pollution :** Pollutants come out from transport vehicles.

5.3 POLLUTANT :

Definition : Pollutant is a substance which has the potentiality to adversely affect natural characteristics of environment. Pollutant at may be a substance a wrong place, e.g., fertilizer causes water pollution.

5.4 TYPES OF POLLUTANT :

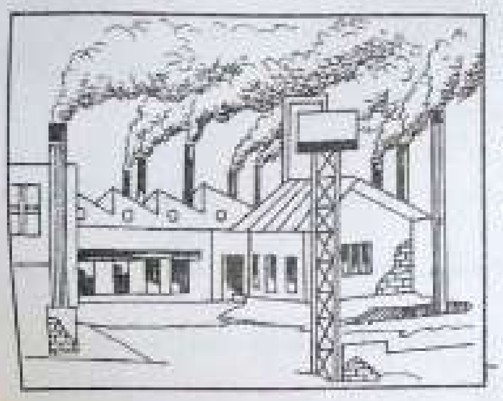
Primary Pollutant : Persisting in the environment in the form of a product e.g. SO_2, Carbon monoxide. **Secondary Pollutant** : Pollutant formed from a primary one through change or reaction. Nitrogen oxides and hydrocarbons react photochemically to produce peroxyacetyl nitrates and ozone. The secondary pollutants are more toxic than the primary ones. The phenomenon is called **synergism**. **Qualitative Pollutant** : It causes harm due to its nature. It is often produced due to human activity, e.g. insecticides. **Quantitative Pollutant** : When its concentration reaches beyond a threshold value, e.g., CO_2, CO.

Degradable Pollutant : The pollutant degrades after sometime either automatically (e.g., heat) or through the agency of micro-organisms (= biodegradable, e.g., sewage, livestock wastes, market garbage). Biodegradable pollutants can be turned into a resource, e.g., compost, manure. **Nondegradable Pollutant** : The pollutant does not get degraded into harmless material, e.g., DDT (dichloro-diphenyl trichloro-ethane), BHC (benzene hexachloride), polythene bags.

Various Types of Pollution :

(i) Air pollution
(ii) Water pollution
(iii) Soil pollution
(iv) Noise pollution
(v) Odour pollution
(vi) Thermal pollution
(vii) Marine pollution
(viii) Nuclear Hazards or Radioactive Pollution

5.5 AIR POLLUTION



Definition : "Air pollution is the excessive concentration of foreign matters in the air which adversely affects the well-being of the individual or causes damage to prosperity"- American Medical Association.

Air pollutants can be classified as follows.

1. Natural contaminants : Fog, pollen grains, bacteria, products of volcanic eruption.

2. Aerosols : Dust, smoke, mists, fog and fumes.

3. Gases and vapours : Sulphur compounds (SO_2, SO_3, H_2S), nitrogen compounds (NO, NO_2, N_2O), oxygen compound (O_3, CO, CO_2), Halogen compounds (HF, HCl) organic (Aldehydes, hydrocarbons) and Radioactive compounds.

Sources :

(i) **Natural sources**—Forest fires, volcanic eruptins, decomposition of dead bodies, cosmic dust particles, dust storms, salt particles.

(ii) **Anthropogenic or Man-made :**

Industries, Fumes from motor vehicles, industrial and domestic sources, agricultural activities, destruction of forests.

Causes for production of **Aerosols, dust particles, smoke, mists, fog and fumes in any big city like Kolkala.**

(i) **Combustion** : Fuel burning (coal, wood, fuel oil), incinaration of house and municipal garbage, open fires, forest fires, tobacco smoking.

(ii) **Materials handling and processing** : Loading and unloading of sand, gravel, coal, ores, lime, cement, crushing and grinding of ores, stones, rocks, cement etc. mixing and packaging of chemicals, fertilisers, food processing, saw mills, cutting and forming of plastics, industrial (paper and textile manufacture).

(iii) Construction of roads, buildings, dams, site clearance, mining, agricultural soil filling, land preparation and winds.

(iv) House cleaning, mud road cleaning, crop spraying, poultry feeding and engine exhaust.

Important gaseous pollutants are : (a) sulphur dioxide (SO_2): Produced due to combustion of fuels, metallurgical operations as the ores of zinc, copper and lead are primarily sulphides. Sulphuric acid plant and paper manufacturing plants, the open burning of refuse and municipal incinerations contribute SO_2 into the atmosphere.

Harmful effects :

(i) SO_2 causes burning sensation, pulmonary disease, bronchitis asthma, lungs cancer and irritation in the eyes. (ii) SO_2 is responsible for acid rain. (iii) When SO_2 reacts with smoke harmful smog is formed.

(b) Nitric Oxide (NO)

Source :

(i) Gas emitted from vehicles (ii) Factories (iii) Thermal power station (iv) Chemical industries.

Harmful Effects :

(i) Causes repiratory diseases, (ii) Irritation in respiratory tube or lungs.

(c) **Nitrogen di-oxide (NO_2)**

Sources :

(i) Thermal power station (ii) Factories producing nitric acid (iii) Smoke emitted from different vehicles.

Harmful effects :

(i) It causes diseases related to our respiration, digestion and nervous system. (ii) It causes irritation in lungs and also in mucous membrane. (iii) Growth of plants may be disturbed. (iv) Rate of photosynthesis may be lowered.

(d) **Carbon monoxide (CO) :**

Source :

(i) Incomplete combustion of coal, petroleum, natural gas emitted from fumes and smoke of vehicles. (ii) Electric and blast furnace. (iii) Factories engaged in production of gases. (iv) Petroleum refineries. (v) Coal mines.

Harmful effects :

Carbon monoxide is a chocking gas. It acts on haemoglobin and releases oxygen from blood to form carboxy-haemoglobin. It also causes headache, drowsiness, loss in sense of perception and even death.

(e) **Hydrogen sulphide (H_2S) :** It is a foul-smelling gas produced due to anaerobic biological decay processes. Major source are the Kraft pulp industry, petroleum refineries, coke-oven plants, viscose rayon plants and some chemical operations.

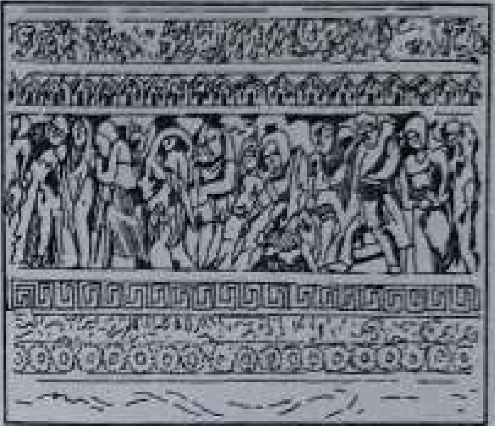
Harmful Effects :

Causes breathing troubles, headache, vomiting, nausea, dizziness.

(f) 'Aromatic hydrocarbons, ozone and oxidants like PAN, PBN cause eye irritation, irritation of the mucous membranes, nose irritation and chest constriction.'

(g) **Particulate Matter.** Soot, fly-ash, dusts of various types, fur, hair, spores, pollen grains, etc. Particulate matter is differentiated into **settleable** (larger than 10μm) and **suspended** (less than 10μm.), SPM (suspended particulate matter) is maximum in Kolkata (Tokyo is the most polluted city of the world.) It is differentiated into **aerosol** (less than 1μm), **dust** (more than 1μm) and **mist** (liquid, more than 1μm), **Smoke** Particles of 2-4 μm size are mostly deposited in the respiratory tract. (i) **Soot** (imcomplete burning of carbohydrates), **smoke, fly-ash** (fine particulate matter passed out alongwith gases during burning of coal) and **dust** cover leaf surface, produce allergic reactions, especially bronchial asthma and chronic bronchitis. (ii) Particulate matter from processing industries causes **pneumoconiosis, byssinosis, emphysaema, siderosis** and other pulmonary problems. *(iii) Dust and smoke produce smog, (iv) Dust also produces pesticide-rich mist. (v) Dust contain heavy metals like (Hg, Pb, Cu, Fe). (vi) Dust also contain pollen and dust mites. All of these cause respiratory problems.*

(h) **Carbon Dioxide.** It is a greenhouse gas, the concentration of which is constantly rising. In excess it causes headache and nausea.



(i) **H_2S.** It is a product of putrefaction, treatment of sulphur containing ores, refineries, etc. It causes mottled chlorosis and defoliation in plants, decolourises paints, produces eye and throat irritation and nausea.

(j) **Hydrocarbons (HCs) or Volatile Organic Carbons (VOCs).** They are produced naturally (e.g., marsh gas) as well as due to imcomplete combustion. Hydrocarbons, especially polynuclear aromatic and formaldehyde are carcinogenic, cause irritation of eyes and mucous membrance and bronchial constriction. Hydrocarbons give rise to secondary pollutants or photochemical oxidants with nitrogen oxides. Methane (marsh gas) is produced naturally during decomposition of organic matter, paddy fields (40% of the total), and incomplete combustion in automobiles, it is a green house gas which is oxidised in the atmosphere to CO_2.

(k) **Chlorofluorocarbons/Chlorofluoromethane/Freon/Aerosols.** They are chemicals used as refrigerants, propellants and solid plastic foams. The chemicals are released as aerosol by jets flying at high altitudes. Chlorofluorocarbons react with ozone of ozonosphere and deplete the same. This can increase the amount of ultraviolet radiations reaching the earth.

(l) **Other Atmospheric Pollutants** are Mercury (burning of coal, smelting), methyl isocyanate (pesticide manufacture), phosgene (pesticide manufacture, dye industry) and lead (automobile exhausts). Bhopal gas tragedy (Dec. 1984) was due to release of phosgene and methyl isocyanate.

(m) **Automobile Exhausts :** Causing 80% of air pollution and 75% of noise pollution in urban areas and release hydrocarbons (13.7%), carbon monoxide (77.2%), nitrogen oxides (7.7%), sulphur oxides, ammonia, aldehydes and lead. Lead is present in petroleum in the form of $Pb(CH_3)_4$ and $Pb(C_2H_5)_4$ as antiknock agent.

(n) **Smog** (Des Vocus, 1905) Smog is dark fog having condensed water vapours, dust smoke and gases (SO_2, H_2S, NO_2 etc.). It causes necrosis in plants, allegies and asthma/bronchitis in humans. Smog is of two types :

Classical (London) Smog. It occurs at low temperature. It contains sulphur gases (hydrogen sulphide, sulphur dioxide), smoke and dust particles. The smog is formed by condensation of water vapours with H_2S and SO_2 over dust and smoke particles. Secondary pollutants are absent. Classical smog occurred in London during December 1952 when it killed over 40000 persons.

Photochemical (Los Angeles) Smog. Photochemical smog contains secondary pollutants or photochemical oxidants. It was first reported over Los Angeles in 194 Photochemical smog is formed at high temperature over cities and towns due to emission of nitrogen oxides and carbohydrates from automobile exhausts and solar energy. Nitrogen oxides, oxygen and ketones combine to form PAN. In areas with intense solar radiations photochemical smog forms **brown air.** The areas with lesser solar radiations, smog formation is incomplete. It forms **grey air.**

Photochemical Oxidants/Secondary Air Pollutants. The secondary pollutants (ozone, peroxyacetyl nitrates, aldehydes and phenol) are produced due to photochemical reactions between nitrogen oxides and unsaturated hydrocarbons.

Reaction inside Engine

$$N_2 + O_2 \rightarrow 2NO$$

Reaction in Atmosphere

$$2NO + O_2 \rightarrow 2NO_2$$

Photochemical Reactions

$$NO_2 \xrightarrow{UV} NO + [O]$$
$$O_2 + [O] \rightarrow O_3$$
$$NO + HC + O_2 \rightarrow NO_2 + PAN$$

Haze : It is obscuring in respect of atmosphere near the earth due to presence of fog, mist, hoar frost, smoke or dust that makes objects indistinct. Fog is a thick cloud of minute water droplets suspended in the atmosphere at or near the earth's surface often alongwith dust and smoke.

(i) **Ozone** : It destroys chlorenchyma, produces necrosis, corrodes surface of marble statues and heritage buildings, injures mucous membranes, dry throat, haemorrhages and eye irritation. (ii) **Peroxy-acetyl Nitrates (PAN)**. They damage chloroplasts, inhibit controlling cellular metabolism. Young and spongy parenchyma cells are destroyed. In human beings they cause respiratory disester and eye irritation. (iii) **Aldehydes.** Irritation in gastro-intestinal and respiratory tracts. (iv) **Phenols.** Damage to kidneys, liver spleen and lungs.

(O) Pollen/Spores. They cause allergic reactions or hay fever in certain persons.

Effects of air pollution on plants.

Air pollutants have some damaging effects on plants, especially, on leaves.

	Types of leaf damage
Types of damage	**Symptoms**
1. Necrosis	– Killing or Collapse of tissues
2. Chlorosis	– Loss of the green plant pigment–chlorophyll – Usually resulting in a pale green or yellow pattern.
3. Abscission	– Dropping of leaves of this plants
4. Epinasty	– Causing downward curvature of the leaves

Effect of Sulphur dioxide

The injury of Sulphur dioxide is characterized by the killing of marginal or interveinal areas of the leaf. The leaves dry up and usually bleach to an ivory colour or brown or reddish-brown colour.

Effect of Hydrogen fluoride

It is effective in causing lesious and interfering with photosynthesis.

Effect of Ozone

The effects of ozone on plants is mild and severe doses cause premature aging, suppressed growth, collapse of leaf, necrosis and bleaching.

Effect of Nitric oxides

The effects include brown margins and brownish-black spots on the leaves.

Effect of Ethylene

The effects are epinasty, curling, chlorosis, leaf abscission, and growth retardation.

The effects of air pollutants depend on concentration and exposure period. In table 6.3. a list has been given indicating the effects of air pollutants with concentration in ppm and exposure period.

Effects of SO_2	Health Effects of particulate matters
1. Increase of breathing dis order Increased daily rate.	These are Neurotoxin. Affect blood system, cause behavioural disorders.
	Cardiovascular diseases and hypertension interference with zinc and copper metabolism.
2. Increase of hospital admissions of aged people's respiratory disease cases.	Affect respiratory systems, lungs cause cancer (as nickel carbonyl)
3. Increase of frequency of respiratory and lungs disease.	Damage Kidney, Nerve and brain.
4. Increased incidence of respiratory disease among school children.	Affects mucus membrance of eyes and lungs. Cause shortness of breath, weight loss, Lungs Cancer and affects heart.
	Causes asbestosis, Shortness of breath, Pleural calcification and Lungs Cancer.

Effects of COH_b

Effects on healthy individuals	Effects on heart Patients
Blood flow to certain vital organs increases to compensate the reduction in oxygen carrying capacity of blood.	Heart patients may suffer from in-sufficient cardiac reserve to compensate less flow of Oxygen.
	Patients with angina pectoris may suffer from chest pain.
Laboured respiration during exertion, visual evoked response is abnormal.	COH_b may be lethal for patients with severe cardio-vascular disease.

Effects of oxides of nitrogen on human health

Increase in acute respiratory disease

Increase in acute bronchitis in school children

Human olfactory threshold

Increase in airway resistance

Pulmonary a edema

EFFECTS ON MAN

(i) Dust, soot and smog cause bronchitis, asthma, emphysema and lungs cancer. Cotton dust produces lungs fibrosis or **pneumoconiosis** also called **byssinosis.** Pneumoconiosis also affects the coal-miners and flour-mill workers. Lungs fibrosis which are produced in the workers of some other industries include **asbestosis** (asbestos industry), **silicosis** (stone grinding), **siderosis** (iron mill), etc.

(ii) Metal dusts, fly-ash cause headache, loss of appetite, dizziness, insomnia, anaemia, weakness and miscarriage.

(iii) Sulphur dioxide causes drying of mouth, sore throat, eye irritation and damages the tissues by forming sulphuric acid.

(iv) Air-borne organic materials (spores, pollen, bacteria, fungi, fur, feathers) cause several diseases and allergic reactions or **hay fever.** Common plants which produce allergic pollen are *Amaranthus spinosus, Chenopodium album, Prosopis chilensis* etc.

(v) Carbon monoxide combines with haemoglobin of the blood and reduces the oxygen carrying capacity of the blood. Inhaling of carbon monoxide leads to giddiness, reduced vision, cardio-vascular disorder and even death. Nitrogen oxide is comparatively less soluble, *but at high concentration it impares the functioning of lungs.*

(vi) Ozone is formed in the atmosphere by photochemical reaction. In the stratosphere it protects the earth from high energy ultra-violet radiations. But in the lower level it produces chest pain, coughing and eye irritation.

(vii) Due to depletion of ozone layer ultra-violet radiations cause skin cancer and mutation rate in general.

(viii) Hydrocarbons like benzopyrene causes lungs cancer.

(ix) PAN (Peroxyacetyle nitrate) causes acute irritation of eyes.

Effects on Vegetation

(i) Particulate matter reduces sunlight and retards photosynthesis.

(ii) Sulphur dioxide causes chlorosis, plasmolysis and membrane damage. Fruit trees and cereal crops are more sensitive to oxides of sulphur and they suffer a great loss.

(iii) Fluorides destroy leaves causing necrosis of leaf margins and tips.

(iv) PAN damages chloroplasts and the photosynthetic efficiency and growth of plants are reduced.

(v) Ozone damages chlorenchyma and destructs the foliage of plants.

(vi) Hydrocarbons (ethylene) cause premature leaf fall, fruit drop, curling of petals and discolouration of petals.

(vii) The death of lichens in an area is an indicator of air pollution as they are very sensitive to pollution.

(viii) Acid rain affects vegetation of both land and water.

Control of Air Pollution

Air pollution can be controlled by the following methods :

1. Preventive Measures :

(i) Suitable fuel (e.g., fuel with low sulphur should be selected to reduce air pollution.

(ii) Modifications in industrial equipment to reduce emission.

(iii) Selection of suitable manufacturing site i.e., setting of industries at a distance of residential areas, and installation of tall chimneys.

2. Control Measures : The pollutants may be reduced by destroying the pollutants by thermal process of catalytic combustion, changing the pollutants to a less toxic form, and collecting the pollutant by using equipment to prevent its escape into the atmosphere.

Control of Particulate Matters :

To seperate particulate matters from contaminated air **cyclonic separators** and **trajectory separators** are commonly used with minimum moisture content. These separators work on the principle of dust separation by centrifugal force. Extremely fine particulate matters are collected by **filters.**

The most effective device to remove particulate pollutants is electrostatic precip (ESP) which works on the principle of electrical charging of the dust particles and coll it on a differently charged platform.

(ii) Scrubbers are used to clean air for both dusts and gases by passing it though or wet packing material.

(b) **Control of Gaseous Pollutants**

(i) The gaseous pollutants are completely burnt at a high temperature by combus process.

(ii) The gaseous pollutants are absorbed in suitable absorbent materials by absorp technique.

(iii) Toxic gases, vapours and inflammable compounds that could not be effic removed by the above techniques are absorbed on large solid surfaces.

(c) **Control of Automobile Exhaust**

(i) The hydrocarbons of auto-emissions can be reduced by the use of multi-point injection engine.

(ii) Catalytic converter filters reduce the potential hazards of NO_x.

(iii) The toxic contaiminants in exhaust can be reduced by drastically using good e.g., lead-free petrol, C.N.G. etc.

✗5.6 WATER POLLUTION

Water Pollution may be defined as–

Alteration in physical, chemical and biological characteristics of water brought abo mainly by human activities and natural resources which may cause harmful effects human and aquatic biota.

Types of water pollution :

1. Physical pollution of water.
2. Chemical pollution of water.
3. Biological pollution of water.
4. Physiological pollution of water.

1. Physical pollution of water

Colour : Colour change may affect the quality of sunlight that penetrates to a giv depth inhibiting plant and animal metabolism.

Turbidity : Turbidity in water mainly arises from colloidal matter and the degree turbidity of a water course may be taken as a measure of the intensity of pollution whi is unsuitable for industrial purposes and also for domestic use.

Taste : Industrial effluents containing Fe, Mn, free Chlorine, Phenols and aqua actinomycetes and the decomposed organic matter, algae, fungi, bacteria, and pathog impart peculiar taste.

Odour : Micro-organisms like algae, oscillatoria cause muddy odour, algae, Anabaena produces a strong grassy odour. Protozoa imparts fishy odour to water.

Foam : Foam is produced by soaps, detergents and untreated organic effluents from paper and pulp industries.

Thermal pollution of water : The heated water of power plants have reduced the amount of dissolved oxygen (DO) content due to which organic matter degrades faster.

2. Chemical pollution of water

The chemical pollution of water by organic pollutants or inorganic pollutants or by both causes changes in acidity, alkalinity or pH, dissolved oxygen (DO) and other gases in water.

3. Biological pollution of water

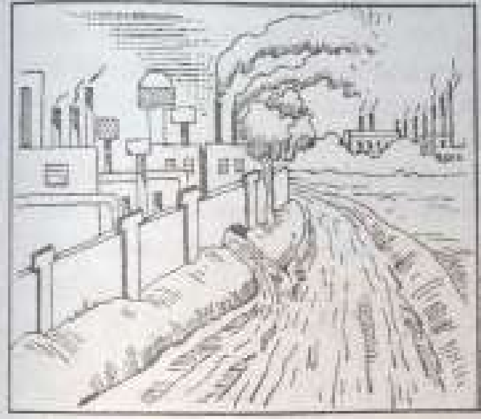
Biological pollution is brought about by bacteria, viruses, algae, diatoms like protozoa, rotifers, crustaceans and plant toxins create infections of the intestinal tract, polio and infectious hepatitis.

4. Physiological Pollution of water

Physiological pollution of water is caused by chlorine, sulphur dioxide, hydrogen sulphide, ketones, phenols. It makes water taste like medicine and produces offensive odour.

Sources of Water Pollution :

(i) **Sewage** : Municipal sewage consists of the faeces and nitrogenous wastes of animals. It is rich in organic matter and nitrogen compounds. Due to the discharge of untreated or partially treated sewage into the drinking water resources, such as rivers, lakes, etc., and as it is allowed to accumulate, it will have serious effects in the ecosystem. Bacteria will proliferate enormously causing depletion of oxygen content of the water as they use up oxygen and increase the amount of toxic nitrogen compounds (ammonia).



(ii) **Industrial wastes and effluents** : Treated and untreated discharges from fertilizer factories, distillaries, paper mills, etc., are capable of causing dangerous water pollution. There is a depletion in the oxygen content of water. These wastes alter the temperature of the water and change the colour of the water which sometimes becomes turbid and the surface water is covered with oil-film.

(iii) **Thermal pollution** : The discharge of heat from power station, raises the temperature of the water of river, streams, lakes, estuaries etc. The metabolic rate and oxygen consumption of the micro-organisms is increased. This results in the depletion of oxygen which makes it all the more difficult for the fish or fauna to survive and some animals are killed outright by the hot water and the entire ecological balance of a water body can be affected by thermal pollution.

(iv) **Mercury pollution** : It is the by-product of various chemical processes and a constituent of certain agriculture fungicides. The level of mercury in fresh water lakes and rivers has been rising in recent years. It has been also established that mercury can become highly concentrated in the body of the fishes, probably, several thousand times more than the surrounding water.

(v) **Silt pollution** : Dust and dirt are the components of the soil, which all together are called **silt.** Silting can choke rivers and irrigation channels and many edible fishes, such as Salmon, are unable to spawn on silted gravel beds. The sand and silt particles carried from the soil to water constitute very harmful or serious pollutant.

(vi) **Pollution by asbestos** : Asbestos is a fibrous material and its full disintegration is almost impossible. The asbestos scraps reach the water bodies and cause pollution. It is supposed that the pollution by asbestos may be a source of gastro-intestinal malady and of the lung SI cancer.

(vii) **Fertilizers and detergents** : In agriculture to increase the yield large amounts of fertilizers and other soil additives are used. Some of these run off the soil through irrigation, rainfall, drainage, etc., into streams and rivers and causes environmental pollution.

Effects of Water Pollution

The effect of water pollution depends on the type of pollutants which brings about physical and chemical changes that make the water unfit for drinking and harmful to aquatic life.

1. Effects on Aquatic Ecosystem : Organic and inorganic wastes of water decreases the dissolved O (DO) content of the water. Water having DO content below 4.0 mg/lit is considered to be highly polluted and water having DO content below 8 mg/lit is considered as contaminated water. DO content of water is important for the survival of aquatic organisms. A number of factors determine the amount of DO present in water. Oxygen consumption by organism and decomposition of organic matter are the important factors.

BOD is a measure of oxygen required by aerobic decomposers for the biochemical degradation of organic materials (i.e., biodegradable materials) in water.

The higher amounts of organic waste increase the rates of decomposition and O_2 consumption, which decreases the DO content of water. The demand for O_2 is directly related to increasing input of organic wastes and is expressed as **biological oxygen demand (BOD)** of water. It is expressed in milligram of oxygen per litre of water. The higher value of BOD indicates low DO content of water. BOD is not a reliable method of measuring pollution load in water as it is related to biodegradable materials. **Chemical oxygen demand (COD)** is the measure of oxygen equivalent of the requirement for oxidation of total organic matter (i.e., biodegradable and non-biodegradable) present in water. Hence it is the better method to measure the pollution of the water. Polluted water effects aquatic ecosystems.

(i) The contamination of water bodies by pollutants reduces DO content and eliminates sensitive organisms like plankton, molluscus and fish, etc. except Tubifex (annelid worm) and some insect larvae which may survive in highly polluted water with low DO content. Such species are recognised as indicator species for polluted water.

(ii) Biocides, polychlorinated biphenyls (PCBs) and heavy metals, such as Hg, Pb, Cd, Cu, As, etc. directly eliminate certain species of organisms.

(iii) Hot water discharged from industries lowers its DO content.

2. Biological Magnification : The process through which certain pollutants get accumulated in tissues in increasing concentration along the food-chain is called biological magnification. The non-degradable organo chlorine compounds such as DDT, some other pesticides are the most persistent pesticides. Once they are absorbed by an organism, they get accumulated in fat-containing tissues of the organisms. A classic example of biological magnification is the accumulation of DDT in the tissues of organisms of aquatic food-chain.

3. Eutrophication : The process of nutrient enrichment of water, which often leads to the loss of species diversity is called eutrophication. The addition of inorganic compounds and decomposition of organic wastes in water bodies increase the nutrient content of water which is responsible for growth of algae, especially the blue-green algae, and may fatally cover the water surface. This type of algal growth is called **algal bloom.** The algal bloom often releases toxins in water, and inhibits the growth of other algae. Aquatic animals (e.g., fishes) may also die due to toxicity or lack of oxygen.

4. Effects on Human Health :

(i) The water polluted with sewage contains pathogens like virus, bacteria, parasitic protozoa and worms which is a source of water-borne diseases like jaundice, cholera, typhoid, amoebiasis, etc.

(ii) The water contaminated with heavy metals can cause serious health problems. Mercury compounds in waste water are converted by bacterial action into extremely toxic methyl mercury, which is responsible for deafness, blurring of vision and mental derangement.

5. Hazards of Groundwater Pollution : Groundwater gets contaminated due to seepage from industrial wastes and agricultural run-off.

(i) Presence of high amount of nitrate in drinking water is dangerous for human health and may be fatal for infants. It reacts with haemoglobin to form non-functional **methaemoglobin,** and impairs oxygen transport, which is called **methaemoglobinemia** or **Blue baby syndrome.**

(ii) Excess flouride in drinking water causes teeth deformity, hardening of bones and stiff and painful joints **(skeletal fluorosis).**

(iii) Over-exploitation of groundwater may lead to leaching of arsenic from soil and sources and contaminate groundwater. Arsenicosis is a disease which is create due excess amount of arsenic. Chronic exposure to arsenic causes **black foot disease**. It causes diarrhoea, peripheral neuritis, hyperkerotosis and also lungs and skin cancer

CONTROL OF SURFACE WATER POLLUTION

(i) Controlling the amount of nutrients and organic substances entering the lakes.
(ii) Microbial decomposition of bottom sediments by various means.
(iii) Removal of dissolved nutrients from water by chemical and physical process
(iv) Reducing the amount of nutrients recycled into water by the death of algae and higher plants by mechanical removal of the algal bloom and higher plants.
(v) Setting up of natural food-webs where fishes are the consumers and which can remove the algae.
(vi) The growth of algae and higher plants can be controlled by the use of appropriate doses of copper sulphate and sodium arsenite.
(vii) Removal of asbestos fibres by filtration through diatomaceous earth.

(viii) Monitoring of the levels of toxic materials in the aquatic ecosystem.
(ix) Evaluation of structural changes in the ecosystem caused by the industrial wa
(x) Restricted application of biocides eg., DDT.
(xi) The effluent should meet the CPCB standards before discharge into the surfac water bodies.
(xii) Disposal of treated municipal waste, regular monitoring of water quality of the ri and lakes subjected to pollution.

Following steps are suggested for the protection of groundwater—

(i) The contaminant sources should be carefully surveyed in case of drinking wat
(ii) Location of industrial and municipal disposal sites should be decided according the groundwater levels and flow pattern in the area.
(iii) In case of toxic industrial effluents, steps should be taken for predisposal 'treatme by industry itself strictly.
(iv) Location of wells, tubewells for drinking water should be selected with ultra caution.
(v) *It is not advisable to tap the uppermost aquifer in case of drinking water wells.*

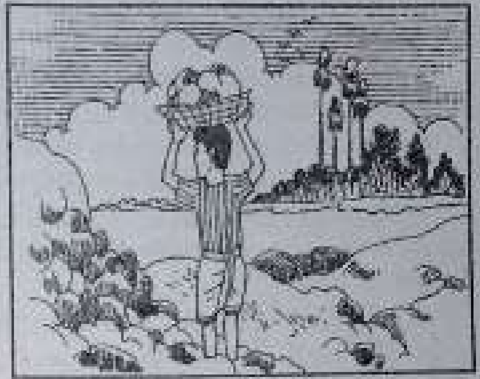
5.7 SOIL POLLUTION

Soil pollution can be defined as the addition of substances to the soil, which adversely affect physical, chemical and biological properties of soil and reduces its productivity.' Soil constitutes the upper crust of the earth which supports land plants and animals. Like air and water, soil also gets polluted. The process of soil formation is very slow, therefore, the soil may be considered as non-renewable resource. This makes the problem of soil pollution more acute.

Source of Soil Pollution

Soil pollution may occur directly by dumping and disposal of wastes, application of agrochemicals or the indirect result of air pollution such as acid rains. The main soil pollutants are : (i) industrial wastes (ii) pesticides (iii) fertilizers and manures (iv) discarded wastes (v) radioactive wastes (vi) other pollutants.

(i) **Industrial Wastes :** Both solid and liquid wastes of industries contain a number of toxic chemicals such as mercury, lead, copper, zinc, cadmium, cyanides, thiocyanates, chromates, acids, alkalies, organic substances, etc. These toxic chemicals pollute the soil due to dumping and disposal of wastes. Some toxic chemicals reach the soil by mining operations also.



(ii) **Pesticides :** To kill insects (insecticides), fungi (fungicides), algal bloom (algicides), rodents (rodenticides), weeds (weedicides or herbicides) are used in various field to improve agriculture, forestry and horticulture. They are sprayed on the plants in the form of fine mist or powder. Most of the pesticides are of broad spectrum, they are also called **'biocides'**. Pesticides reduce the population and number of species of living organisms including micro-organisms, thus, effect the structure and fertility of soil. Several pesticides are absorbed by plants, which in turn may affect the entire food-chains and food-webs.

(iii) **Fertilizers and Manures :** Chemical fertilizers are added to the soil to improve crop yield. Excessive use of chemical fertilizers decreases population of useful bacteria and structure of the soil, increases salt content of the soil and reduces productivity of the soil.

The excretory products of animals and digested sewage sluge used as manure pollute the soil. The pathogens contained in these wastes contaminate the soils and vegetable crops and cause serious health hazards for man and domesticated animals.

(iv) **Discarded Materials :** These include concrete, asphalt, rugs, leather, cans, plastics, glass, discarded food, paper and carcasses. The addition of these wastes is sometimes called the **third pollution.**

(v) **Radioactive Wastes** : Radioactive elements from mining and nuclear power plants reach the soil through the water.

(vi) **Other Pollutants** : Many air pollutants together with water pollutants, become part of the soil. The soil also receives some toxic chemicals during weathering of certain rocks.

Salination of Soil : Salination means increase in the concentration of soluble salts in the soil. It adversely affects soil productivity and degrades the quality of land. A number of processes are involved in salination.

(i) The salts of irrigation and flood water accumulate on the soil surface due to inadequate drainage.

(ii) The salts from the lower layers of the soil move up by capillary action in summer and get deposited on the surface.

(iii) The groundwater in arid regions adds to salination, if it is used for irrigation.

(iv) Excessive use of sodium nitrate may cause salination of the soil.

(v) In coastal regions, winds bring lot of salt from raw water to land.

(vi) The soil formed from the saline rocks reduces soil productivity. India has about million hectares of saline land. This is due to the intensive farming with poor drainage of the soil.

Control of Soil Pollution :

(i) For bulk transfer of refuse to discharge sites transfer stations should be constructed at various points in cities.

(ii) For collecting and disposing wastes pneumatic pipes should be laid.

(iii) For dumping industrial wastes special pit or low lying areas should be selected.

(iv) Materials such as paper, glass and some kinds of plastic can be recycled. It is costly but conserves resources. At least 17 trees can be saved by preparing one tonne of paper through recycling.

(v) Animal refuse and agricultural wastes should be utilized for production of bio-gas.

(vi) The use of chemical fertilizers can be replaced by applying biofertilizers.

(vii) Biological pest control methods should be applied.

(viii) Improvement in mining techniques can reduce the spread of mine dust.

Process to Control of Soil Pollution

Disposal of waste consists of (a) Recovery and Recycling, (b) Source reduction, (c) Burning, (d) Dumping.

1. Recovery and Recycling : The articles like tins, cans and other metal wastes, glass, plastic, polyethylene rags, paper and cardboard can be recovered and recycled. Metal waste can be melted and purified. Broken glass is used similarly to form new glass. Waste paper, card board, waste cotton textiles form paper. Plastic forms new inferior plastic. Waste polyethylene is melted and recast to form new polyethylene.

2. Source Reduction : Garbage and other organic wastes are taken out of urban areas and used for formation of compost, biogas and manure. Vermiculture is practised to form manure and compost.

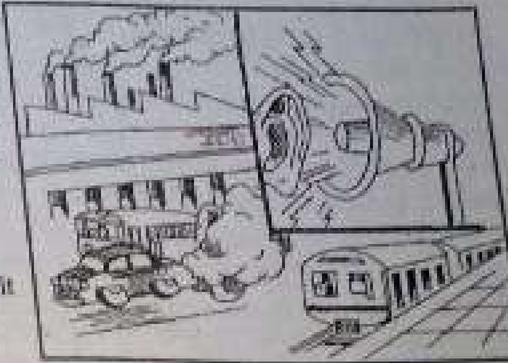
3. Burning : Burning means the combustion of solid wastes having organic materials in open places. (i) **Incineration** : It is the aerobic combustion of wastes inside chambers at temperature of 900–1300°C. Incinerators are fitted with scrubbers and electrostatic precipitators to prevent release of smoke and toxic chemicals. (ii) **Pyrolysis**. Pyrolysis means combustion inside chambers in the absence of oxygen at a temperature of 1650°C. Industrial gases and other useful substances are produced.

4. Construction Material : Fly-ash industrial effluents containing toxic chemicals and hazardous metals is being converted into bricks for construction work. Fly-ash, can be used as padding material for road construction.

5. Dumping (Landfilling) : Dumping is accumulating of waste on selected low-lying land. It is of two types, open and sanitary. (i) **Open Dumping** (Open Landfill). It is piling of waste on uncovered low-lying area. The accumulated waste is periodically burnt or compressed at intervals to reduce its bulk. (ii) **Sanitary Dumping** (Sanitary Landfill). In this type of Landfilling the waste is pulverised, compacted and covered over by a layer of earth.

5.8 NOISE POLLUTION

Noise, is an environmental phenomenon. Noise, commonly defined as unwanted sound, can interfere with work, rest, recreation and sleep. We are exposed to noise thought life and it is not only a nuisance but also a threat to our health.



Noise Measurement Unit

The name of the unit of measurement of noise is decibel (dB), named after Alexander Graham Bell. A decibel is equal to the sound that can be heard by the human ear.

$$1\text{dB} = \frac{1}{10}\text{ B (bel)}$$

WHO has recommended 75 dB as the limit for industrial noise.

Sources of noise

(i) Transport noise, (ii) Machinery noise, (iii) Domestic & neighbourhood noise, (iv) Social, political and cultural noise.

Effects :

(i) **Auditory fatigue** : The areas where noise level is at 60 dB to 65 dB a person starts to experience this sort of auditory effect. The damage reaches its peak value where noise frequency level is 4000 Hz. Auditory fatigueness may be associated with some side effects such as whistling and buzzing in the ears.

(ii) Interference with speech : In the public places noise interferes with speech communication in our daily life.

(iii) Efficiency : People, who are linked with the stressful jobs where mental concentration is a prime importance, desire low level of noise because, it will increase the output of work of those persons.

(iv) Deafness : Temporary or Permanent Hearing loss or deafness is the most harmful effect of noise pollution.

(v) Physiological changes : A number of physiological changes occur in human body as a direct result of noise pollution. These are :

(a) rise in blood pressure (HBP)

(b) an increase in heart rate, i.e., pulse rate.

(c) breathing troubles and increase in sweating.

Control of noise pollution :

(a) The noise can be generated by the household machines, vehicles, the loud speakers, factories, industrial machineries etc. In respect of these sources the level of noise should be controlled.

(b) Noise can be controlled by designing and proper use of silencers and installing them in different vehicles in surface transports and aircrafts, industrial machineries and in home appliances.

(c) Workers, should be provided with ear plugs and ear mulls, or they should take help of cotton soaked in oils which do not cause any harm to their body. Their working hours should be adjusted to ensure that they are not exposed to noise beyond the acceptable limit for a long duration.

(d) Implementation of the better technology to reduce the noise level in various vehicles.

e.g., clothing of the machines of the vehicles is an effective measure to reduce the sound level by approximately 30 dB (decibel).

(e) Legislative approach : We can reduce noise pollution to certain extent, by framing suitable laws and implementing these laws in our practical life.

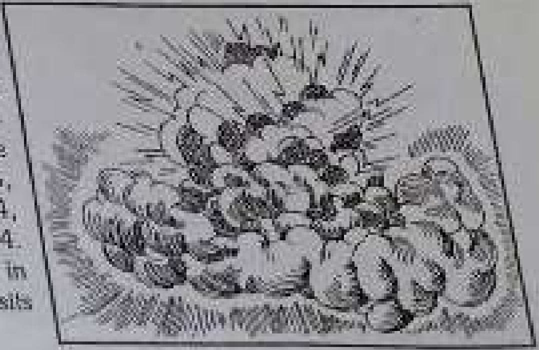
(f) Education : Public education is necessary to implement the measures of checking noise pollution.

Permissible Ambient Noise Levels in Different Zones

Zone	Day (6.00–21.00 hrs.)	Night (21.00–6.00 hrs.)
Industrial area	75 dB	70 dB
Commercial area	65 dB	55 dB
Residential area	55 dB	45 dB
Silent Zone	50 dB	40 dB

5.9 RADIOACTIVE POLLUTION OR NUCLEAR POLLUTION :

Nuclear Pollution is degradation of environment due to release of radioactivity by changes in **nuclides** of unstable/radioactive elements causing short-range and long range harmful effects on living beings. Radioactivity is measured in units called roentgens or r.



1. Background Radiation : This type of radiation level is found naturally in biosphere due to cosmic rays reaching earth and radionuclides which are found in earth's crust. The radioactive elements are Uranium-238, Uranium-235, Thorium-232, Radium-224, Radon-222, Potassium-40 and Carbon-14. Maximum background radiation is found in Kerala beach where 75% of thorium deposits of the world are found.

2. Man-Made Radiations : The radio-active elements are produced due to mining and refining of radioactive elements like Plutonium, Uranium and Thorium, nuclear power plants and fuels, preparation of radioactive isotopes and explosion of nuclear weapons.

Nuclear Weapons : Uranium-235, Plutonium-239 are used for fission and hydrogen or lithium as fusion materials. Due to nuclear explosion the following are produced– (i) Uncontrolled chain reactions, (ii) Tremendous heat, (iii) Neutron flux which is responsible to change other elements to radioactive state, e.g., Barium-142, Cesium-137, Cobalt-60, Phosphorus-32. (iv) Unused explosive products. (v) Radioactive and other gases forming mushroom-type cloud. The radioactive articles are carried to all places polluting air, water, soil and food-chains. Nuclear bombing at Nagasaki and Hiroshima (1945) not only destroyed the two cities, killed thousands of human and animals but also had left a chain of genetic deformities. **Iodine-131** forms thyroxine and damages spleen, bone marrow, produces lungs tomour, skin cancer and sterility. **Strontium-90** causes bone cancer and blood cancer. Cattle, dairy milk, drinking water, and grains all pass on radioactivity to humans. Certain animals accumulate radioactive elements. Examples : Oysters — Zn-65, Fish — Fe-55, Other Marine Animals —Sr-90.

Atomic Reactors : They are used for controlled radioactive fission/fusion for liberation of energy. (i) The coolant water causes thermal pollution. (ii) Small amount of radioactivity undergoes biomagnification to some 75000 times in birds. (iii) They produce halogens and inert gases. (iv) A mishap can be dangerous. E.g., Chernobyl in Ukraine. (v) Radioactive waste is highly pollutant and several precautions are required for dumping.

Radio-Isotopes : These isotopes are used in research (e.g., metabolic pathways), induction of mutations in plants and microorganisms, radiotherapy, etc. e.g., Co-60, P32, C-14, I-125.

Harmful Effects :

Radio-isotopes cause skin burns and cancers. Many plants are killed. Young and recently divided cells are more easily damaged. **Short Range Effects.** Loss of nails and hair, subcutaneous bleeding, changed proportion of blood cells, changed metabolism etc. **Long Range/Delayed Effects**. Tumours, cancers, mutations, genetic deformities and shorter life span etc.

Non-ionising Radiations

They are ultra-violet rays (100—300 nm) which have low penetration. They damage eye-sight due to damage of corneal cells, injury to germinative layer blisters and reddening of skin (sunburn), skin and other cancers due to inactivation of organic molecules and formation of pyrimidine dimers in DNA.

Thermal Pollution : The main source of thermal pollution are the thermal and nuclear power plants. The power plants use water as coolant and release hot waters to the original source. Sudden rise in temperature kills fishes and other aquatic animals.

Hot effluents and hot water (e.g., thermal plants/atomic reactors) contain less oxygen, have lower rate of putrescibility resulting in increased organic loading, replacement of green algae by blue-green ones. In hot water many animals fail to reproduce. *E.g.*, Trout, Salmon.

El Nino is warm ocean or **Peru current** that recurs after 5–8 years. Peru current kills marine animals and plankton over large tracts along Peru and Ecuador coasts.

Certain effects of the appearance of thermal pollution and EL NINO over the climate and living beings of the world have been observed. These are :

(i) A rise in temperature (1-2°C) of the atmosphere.
(ii) More draught in other regions (like Australia).
(iii) More occurrence of storm, cyclone and rainfall in local areas.
(iv) An alteration in nature of coastal forests.
(v) A change in life-style of fish like Antody, some marine mammals and even of fisherman class.
(vi) Change in behaviour of monsoon winds.

Actually the heated water due to thermal pollution have the reduced amount of dissolved oxygen (DO) content due to which organic matter degrades faster. Thermal pollution causes harmful effects on aquatic biota.

Traout, Salmon cannot survive in the high temperature (more than 25°C). Yellow perch cannot bealive in the temparature like more than 31°C. Trout is unable to produce eggs when the temperature rises above 14°C.

Control : (i) The industries should have their own cooling tower and the hot discharge should be released in the environment through cooling tower.

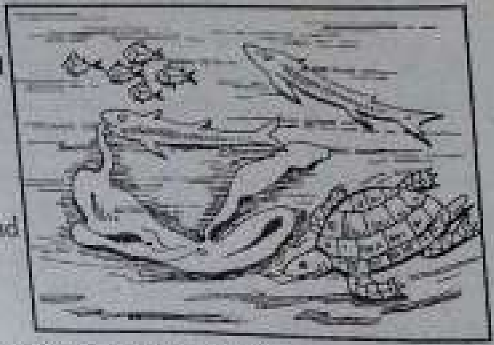
(ii) Thermal power stations should use their own cooling pond.

(iii) Recycling of water may be followed by the industries.

5.10 MARINE POLLUTION

Oceans are the ultimate sink of all natural and man-made pollutants. After collection of pollutants rivers discharge their pollutants into the sea. The other sources of oceanic pollution are navigational discharge of oil, grease, detergents, sewage, garbage and radioactive wastes. Capsized oil tankers, off-shore, oil mining and soil exploration operations and oil refineries mainly contribute to oil pollution of marine ecosystem. An accidental discharge of petroleum in oceans and esturies is called **oil spills.**

Sources of Pollution :



(i) Pollution by domestic and municipal water.
(ii) Pollution by industrial effluents.
(iii) Pollution by agricultural discharges.
(iv) Pollution by radioactive wastes.
(v) Thermal pollution by the power and nuclear plants.
(vi) Pollution due to oil.
(vii) Mercury pollution.

Marine pollution create adverse effect on the marine flora and fauna.

Control of Marine Pollution :

(i) Disposal of treated municipal and industrial waste water.
(ii) Judicious and restricted application of biocides.
(iii) Regular monitoring of water quality of the marine subjected to pollution.
(iv) Precaution should be taken in oil mining, soil exploration operations.
(v) Navigational discharge of oil should be restricted.

5.11 SOLID WASTE POLLUTION

Human and animal activities generates many waste which are useless or unwanted. These wastes are normally solid and are known as solid wastes. The term solid waste includes the discarded mass or throw-aways of urban community as well as of wastes generated by agricultural and industrial activities. Solid wastes can be classified as :

1. Urban Wastes

(i) Food wastes : These wastes decompose rapidly especially in warm weather. For example, vegetable and fruit peels, leftovers of meat, bones, spoiled food items, etc.

(ii) **Rubbish** : These do not decompose rapidly. Different types of rubbish are

(a) ***Combustible*** paper, cardboard, textiles, wood items, rubber, leather, plastic containers,

(b) ***Non-combustible*** crockery, metals, aluminium cans, tin cans, etc.

2. Agricultural Wastes : Crop residues from agricultural fields, farm manure, jute, cotton, rubber, tea, coffee, coconut, sugarcane wastes, rice straw, cattle wastes, etc.

3. Industrial Wastes : Fly-ash, sewage chemicals or sludge, paints, toxic metals, etc. are arised from Industrial activities.

4. Pathological Wastes : Carcasses of animals, slaughter house wastes, etc.

5. Hazardous Wastes : Those wastes which adversely affect human, plant or animal life like radioactive wastes, toxic chemicals, flammable wastes, explosives, hazardous biological wastes from hospitals or research institutions.

6. Construction Wastes : Stones, bricks concrete, dust, plaster, electrical plumbing and sanitary parts are the construction wastes.

Causes of Solid Waste Pollution

(i) Over-population : Solid waste pollution increases with the increasing population.

(ii) Affluence : With affluence there is a tendency to declare items as being out of fashion. This result in solid waste pollution.

(iii) Technology : Returnable glass containers or bottles are being replaced by non-returnable cans, bottles, paper boards and plastic containers. Rapidly growing technologies are responsible for that. Packaging is largely responsible for causing solid waste pollution because packaging materials like plastic bags and cans, etc. are not biodegradable and persist unchanged in disposal operations such as landfills.

Effects of Solid Waste Pollution

1. Flies breed on the refuse dump and solid waste. Diseases like bacillary dysentry, diarrhoea and amoebic dyssentry may result in humans from food and water contamination through flies.

2. Rats depend upon solid wastes. They may also cause plague, salmonellosis, trichinosis, endemic typhus, or such diseases through direct bite.

3. The crops and water supplies may result in large-scale epidemic of various diseases like cholera, jaundice, gastrointestinal diseases, hepatitis, etc.

4. There is a possibility of choking the drains and gully pits by the wastes resulting in water-logging, which in turn results in the breeding of mosquitoes and thus danger of malaria and dengue.

5. Generally obnoxious odours also pollute the air due to decomposition of organic solid wastes.

6. There is also aesthetic danger to the surrounding environment, as the stray animals and scavengers like rat mole, crow, vulture, dog etc. invade the garbage dumps of roadsides.

7. Fumes may pollute air due to the burning of waste products especially plastic containers.

8. Some harmful species may percolate the soil and groundwater from decomposed garbage dumps causing pollution.

Integrated Solid Waste Management

Indiscriminate disposal of solid wastes, especially hazardous waste cause adverse effect. The main objective of solid waste management is to minimise the adverse effects before it becomes too difficult to rectify it in the future.

As solid waste management is a manifold task therefore integrated solid waste management involves many activities like,

1. Collection of solid waste;
2. Disposal of solid waste;
3. Waste utilization;
4. Waste recycling.

1. Collection of Solid Wastes : All the activities associated with collection and gathering of solid wastes and the hauling of the wastes collected to the location from where the collection vehicle will transport it to the site of disposal. There are three methods of collection :

(i) **Community Storage Point** : In this method the municipal refuse is taken of fixed storage bins and stored till the waste collection agency collects it daily.

(ii) **Kerbside Collection** : In advance of the collection time the refuse is brought in containers and placed on the footway. Then it is collected by the waste collection agency.

(iii) **Block Collection** : Individuals bring the waste in containers and hand it over to the collection staff.

2. Disposal of Solid Wastes : The following methods are used for the disposal of solid wastes :

(i) **Sanitary Landfill** : About 90 per cent of the solid waste (garbage) in the city is dumped into natural gulleys, canyons or ravities, in artificial long and shallow trenches, or in swampy and marshy areas or constructed pit or depression and left to disintegrate slowly. Each day the trash is covered with dust from the surrounding areas and compacted. In this way odours together with ugliness can be considerably reduced. Solid wastes may be defined as garbage from home, from commercial activities and waste substances created by agriculture, mining and water purification plants.

Every kind of unusable, undesirable or degraded materials produced in the course of daily human activities are not soft enough as liquid wastes, fall into the category of solid wastes.

There are different methods of solid waste management which lead to the concept of 'waste to wealth'.

(i) Reduction in quantities and avoidance of waste products.

(ii) **Composting** : Composting means taking organic garbage like kitchen wastes, leaves and grasses and handling them in such a way so that naturally occurring micro-organisms will distingrate of break them down and produce a safe, clean and soil-like material called compost. It may occur in the presence of air (aerobic) or in a closed container or underground (Anaerobic). Composting replicates the system used in nature get rid of biodegradable garbage by living organisms like insects, earthworms, fungi, bacteria and other which disstingrate or break down dead plant and animal matter and turn it back into the soil. Whenever the composting is done, it should be kept free from contaminants and toxic chemicals. Composting produces a material that is excellent for restoring organic content to agricultural soils.

(iii) Incineration : Incineration is a waste disposal process by means of which solid, liquid and gaseous wastes are converted through controlled combustion to a residence which contains combustible matters. But incineration is not a safe and complete disposal method to solve the waste problems.

It is a common method of waste disposal in areas with concentrate population. In these areas scarce land and transportation cost made incineration an economic alternative. Combustion of organic and inorganic matter produces toxic substances, (carbon-dioxide, pariculate matter and ash). Pariculate matter and gases that enter into the air cause both health and environmental problems.

(iv) Landfilling :

The landfilling is a method for disposing solid wastes on land without creating any nuisance or hazards in public health and environment. The different methods of sanitary landfillings are :

(a) Area method : In the Area method layers of soil are spread over the layers of pulverized solid wastes. The area is pressed by rolling buldozers.

(b) Trench method : According to this method trenches are dug and the solid waste heaps are pushed into them. These trenches are compacted by pressing them with a buldozer.

(c) Ramp method : In this method a number of gallies, quarries are dug and solid wastes are dumped along the slopes and then covered with soil and pressed.

(v) Recovery of the wastes for recycling or reuse :

In the industrialised nations, waste materials are reused in recycling processes. That means the material is recovered to make the original products, for example, new glass bottles are made from old broken glass bottles and new paper is made from old waste papers. But in the developing countries like India, waste materials are reused in a completely different way. Without going through the process of recovering the original raw materials, these wastes, the old glass, steel, tyres, tin cans etc. are used in completely new forms and function. These are used to make different useful materials, like shoes from tyres, waterbags from leather, lamps from tin cans etc.

Composting of Solid Waste

In many places farmers have to depend on organic manure which is derived from animal excreta, agricultural wastes and vegetation. Under natural conditions dead vegetable and animal materials decompose under the influence of bacteria and fungi, wherever they fall and add to the fertility of the soil. Kitchen wastes and garden wastes in domestic solid wastes is of biodegradable nature. Composting is a biological process. The micro-organisms

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take up biodegradable, organic matter as their food. The aim of composting is to convert a major portion of solid wastes into marketable products. This process can be either aerobic or anaerobic. Composting has three products; compost as an organic fertilizer, salvaged materials for resale and non-compostables as landfill materials.

Compost is a brownish, peaty material and it makes available additional plant nutrients since it contains N, P and K as typical percentages being N = 1.2%, P = 0.7%, and K = 1.2%. When compost is used with artificial fertilizers it makes the phosphorus more readily available and improves nutrient take-up by plants. All trace elements needed by plants (micro-nutrients) are available in compost. The environment gets enriched for plant growth.

Composting needs proper control for odourless production and to destroy pathogens present in the original wastes, to destroy weeds, seeds, to retain maximum nutrient content of N, P and K, to minimize time and the land requirement required for the process. There are two main groups of bacteria i.e., anaerobic bacteria which functions in the absence of oxygen and aerobic bacteria which requires oxygen.

Anaerobic Composting : Anaerobic composting is practised in villages for combined disposal of solid wastes and night soil. The materials are placed in alternate layers in small trenches which are left undisturbed for many months. The contents are used as compost. This is also called the **Bangalore system** which is being abandoned in favour of the cheaper aerobic method.

The important features are :

(i) It is a lengthy process extending over a period of 4-12 months.

(ii) The destruction of pathogens is accomplished by their exposure to an unfavorable environment for long periods and at a low temp.

(iii) The gaseous products are methane, hydrogen sulphide and other gases with offensive odours.

Aerobic Composting : The important features are :

(i) Rapid decomposition of the solid wastes.

(ii) High temperatures attained which achieve speedy destruction of pathogens, insect eggs and weed seeds.

(iii) Absence of offensive smells.

In this indoor system and method many types of organisms such as bacteria, fungi assist in the decomposition. Bacteria predominates while fungi attack cellulosic material and actinomycetes during the final stages. The process begins by the activity of mesophylic bacteria which oxidizes carbon to CO_2, liberating large amounts of heat. Within two days temperature rises to 45°C. Now the thermophilic bacterial stage starts. It lasts about two to three weeks taking temperature to 55 to 70°C. The process is dependent on availability of air and moisture.

5.12 ROLE OF THE INDIVIDUAL IN PREVENTION OF POLLUTION

The role of every individual in preventing pollution is of paramount importance because if every individual contributes substantially the effect will be visible not only at the national level but also at the global level as environment has no boundaries.

Individuals can take a wide range of pollution prevention activities by changing lifestyle in such a way that offers environmental and economic benefits.

It can be done in some of the following ways suggestions or

(i) We should buy recycleable goods.

(ii) We have to reuse and recycle paper, glass, plastic, aluminium, scrap metal and yard wastes.

(iii) We should buy rechargeable batteries for flashlights, toys and household items.

(iv) Avoid buying goods with unnecessary packaging, either plastic or paper.

(v) We have to buy household goods and foods in bulk to minimize packaging waste.

(vi) Consider using reusable mugs, glasses, dishes, cloth towels, etc.

(vii) Try to reduce our dependency on fossil fuel especially coal or oil.

(viii) Take proper step to encourage our community and our institution to begin recycling.

(ix) Improvement of energy efficiency will reduce the amount of waste energy, i.e., more is achieved with less energy.

(x) Reuse and recycling should be undertaken wherever possible and reduce the production of wastes.

(xi) Steps should be taken to adopt and popularize renewable energy sources.

(xii) Use mass transport system. For short visits we should use bicycle or go on foot. Use of automobiles must be decreased.

(xiii) Use pesticides only when those are absolutely promoted and integrated pest management, including alternate pest control methods (biological control), should be used.

(xv) Rechargeable batteries will reduce metal pollution.

(xvii) The solid waste generated in a manufacturing process that can be used as a raw material for some other processes.

(xviii) Use low phosphate-free or biodegradable dish washing liquid, laundry detergent and shampoo which will reduce eutrophication of water bodies.

(xix) Use organic manure instead of commercial inorganic fertilizers.

(xx) We should not put pesticides, paints, solvents, oils or other harmful chemicals into the drain or ground water.

(xxi) The minimum required amount of water for various activities should be used. This will prevent fresh water from pollution.

5.13 HAZARDOUS SOLID WASTE MANAGEMENT-A CASE STUDY

In Eastern India, Haldia is an industrial town in West Bengal, about 70 kilometers away from Kolkata. That is one of the most important industrial centers with IOC Refinery, Haldia Petrochemicals, Mitsubishi Chemicals, Hindustan Lever, Exide and other manufacturers. A huge quantity of industrial solid waste, mainly hazardous in nature, is generated as a result of these industrial operations. The industries are storing the waste inside their factory premises, or disposing part of it illegally in the surrounding areas. The Haldia Development Authority, which has acquired land for a waste treatment and disposal site was requested to develop a project report. The report will identify methods for collection, treatment and disposal of the waste from industry premises according to the international standards, and include recommendations for financial strategies or polices supported to by due diligence and engineering drawings. When the request for proposals was announced, the United States-Asia Environmental Partnership (US-AEP) informed the consulting firms in its network about the opportunity. As a result, the Indian office of the U.S. environmental firm Tetra Tech EM Inc. secured the contract for this project.

5.14 BHOPAL GAS TRAGEDY : A CASE STUDY

On December 3, 1984 in Bhopal India, world's most deadliest gas pollution occured due to the escape of methyl isocyanate (MIC) gas in the air. It is a toxic gas (an intermediate product of a pesticide, sevin) and blasted of a large storage tank of the American multinational corporation, Union Carbide. In order to prevent polymerisation of MIC it is stored with phosgene. Accidental addition of water causes phosgene to react and to produce HCl which catalyses polymerisation of MIC. An enormous amount of heat was produced and 40 tonnes of MIC was released.

As the MIC came out of the tank, it changed into a gas. Plant workers were unable to stop the leak or neutralise the gas as all the things went out of control.

The gas that leaked from the tank killed 3,000 residents of Bhopal. An additional 3,00,000 people suffered damage to their eyes, brains, immune systems, kidneys, intestines or livers. Women who were pregnant at the time of the leak gave birth to dead or deformed babies. About 3000 cattles, goats and other animals died.

The tragedy is a burning example of one of the deadliest disaster caused by human negligence in respect of the maintenance. The factory lacked an automatic safety system. The management of the plant believed that a manual safety system was better. The Bhopal Board did not have the instruments needed to measure emissions from the plant. When the Board received the reports that cows had died because of discharge from the plants drainage system, months before the leak, it took no action.

The disaster raised questions worldwide about the suitable places where such factories should be located.

(i) Chemical plants should be located far away from residential areas.

(ii) No residential areas should be located in the down wind direction in respect to it such industries.

(iii) EIA study should be done before establishing siting such industries.

(iv) Disaster Management Plane (DMP) on and offsite emergency should be formulated.

(v) Awareness and training programme should be under taken for the local people to protect themselve in case of such accidents.

5.15 Hazardous Wastes (Management and Handling) Rules, 1989 :

These rules were frame in 1989 under Section 2(e) of Environment (Protection) Act, 1986 and were amended in January 2000. Main objectives of these rules are :

(a) A permit system to regulate the handling and disposal of hazardous wastes.

(b) To fix responsibility for proper handling, storage and disposal of hazardous wastes.

(c) To identify major accidental hazards and take adequate safety measures.

(d) To follow the rules in accordance with Central Motor Vehicle Rules of 1989 for transport of hazardous chemicals.

(e) In 1996, the Chemical Accident Rules were incorporated. These rules emphasise the establishment of crisis groups at the national, state, district and local levels to prepare emergency plans to deal with major chemical accidents.

(f) In 1998, the Biomedical Waste (Management and Handling) Rules were incorporated. Under these rules, ten categories of biomedical wastes need to be segregated, packed and disposed off.

5.16 BIOMEDICAL WASTE (MANAGEMENT AND HANDLING) RULES, 1998

To stop the indiscriminate disposal of biomedical wastes, Ministry of Environment and Forest in 1998 framed certain rules which were amended in June 2000. These rules are:

(a) Every hospital and nursing home shall install an appropriate facility like incinerator, microwave autoclave, etc. for proper treatment of biomedical wastes.

(b) Every hospital or nursing home shall apply for authorisation and also submit annual report to the competent authority by 31 January every year.

(c) Biomedical waste must be segregated into containers or bags at the point of their generation prior to their transportation.

5.17 BIOMEDICAL WASTE

Biomedical waste is any kind of waste containing infectious (or potentially infectious) materials. It may also include waste associated with the generation of biomedical waste that visually appears to be of medical or laboratory origin (e.g., packaging, unused bandages, infusion kits, etc.), as well research laboratory waste containing bioinolecules or organisms that are restricted from environmental release.

Biomedical waste may be solid or liquid. Examples of infectious waste include discarded blood, sharps, unwanted microbiological cultures and stocks, identifiable body parts (including those as a result of amputation), other human or animal tissue, used bandages and dressings, discarded gloves, other medical supplies that may have been in contact with blood and body fluids, and laboratory waste that exhibits the characteristics described above. Waste sharps include potentially contaminated used (and unused discarded) needles, scalpels, lancets and other devices capable of penetrating skin.

Biomedical waste is generated from biological and medical sources and activities, such as the diagnosis, prevention, or treatment of diseases. Commog generators (or producers) of biomedical waste include hospitals, health clinics, nursing homes, emergency medical services, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and morgues or funeral homes. In healthcare facilities (i.e., hospitals, clinics, doctor's offices, veterinary hospitals and clinical laboratories), waste with these characteristics may alternatively be called medical or clinical waste.

Biomedical waste is distinct from normal trash or general waste, and differs from other types of hazardous waste, such as chemical, radioactive, universal or industrial waste. Medical facilities generate waste hazardous chemicals and radioactive materials. While such wastes are normally not infectious, they require proper disposal. Some wastes are considered multihazardous, such as tissue samples preserved in formalin.

Management

Biomedical waste must be properly managed and disposed of to protect the environment, general public and workers, especially healthcare and sanitation workers who are at risk of exposure to biomedical waste as an occupational hazard. Steps in the management of biomedical waste include generation, accumulation, handling, storage, treatment, transport and disposal.

The development and implementation of a national waste management policy can improve biomedical waste management in health facilities in a country.

Treatment

The goals of biomedical waste treatment are to reduce or eliminate the waste's hazards, and usually to make the waste unrecognizable. Treatment should render the waste safe for subsequent handling and disposal. There are several treatment methods that can accomplish these goals.

Biomedical waste is often incinerated. An efficient incinerator will destroy pathogens and sharps. Source materials are not recognizable in the resulting ash.

An autoclave may also be used to treat biomedical waste. An autoclave uses steam and pressure to sterilize the waste or reduce its microbiological load to a level at which it may be safely disposed of. Many healthcare facilities routinely use an autoclave to sterilize medical supplies. If the same autoclave is used to sterilize supplies and treat biomedical waste, administrative controls must be used to prevent the waste Topuratons from contaminating the supplies. Effective administrative controls include operator training, strict procedures, and separate times and space for processing biomedical waste.

Microwave disinfection can also be employed for treatment of Biomedical wastes. Microwave irradiation is a type of non-contact heating technologies for disinfection. Microwave chemistry is based on efficient heating of materials by microwave dielectric heating effects. When exposed to microwave frequencies, the dipoles of the water molecules present in cells re-align with the applied electric field. As the field oscillates, the dipole attempts to realign itself with the alternating electric field and in this process, energy is lost in the form of heat through molecular friction and dielectric loss. Microwave disinfection is a recently developed technology which provides advantage over old existing technologies of autoclaves as microwave based disinfection has less cycle time, power consumption and it requires minimal usage of water and consumables as compared to autoclaves.

For liquids and small quantities, a 1-10% solution of bleach can be used to disinfect biomedical waste. Solutions of sodium hydroxide and other chemical disinfectants may also be used, depending on the waste's characteristics. Other treatment methods include heat, alkaline digesters and the use of microwaves.

For autoclaves and microwave systems, a shredder may be used as a final treatment step to render the waste unrecognizable. Some autoclaves have built in shredders.

5.18 ELECTRONIC WASTE

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

Electronic scrap components, such as CPUs, contain potentially harmful components such as lead, cadmium, beryllium, or brominated flame retardants. Recycling and disposal of e-waste may involve significant risk to health of workers and communities in developed countries and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incineratorashes.

Hazards of e-waste

1. Hazardous Gases : Generation of such large quantity of e-waste is a big environmental hazard. Only 15–20% of the e-weste recycled and rest go to landfills and incinerators for shredding for reclaiming metals etc. The incineration produces hazardous smoke and gases that pollute the environment.

2. Landfill : Dumping of e-waste for land-filling pollutes soil, underground water and our water resources due to surface runoff with heavy metals, like lead, cadmium, mercury and copper etc.

3. Workers employed in electronic waste processing industries are exposed to various health problems.

E-waste Management

Recycling and reuse of electronic waste are the best ways of e-waste management.

1. Recycling

E-waste contains various valuable metals like lead, copper, silver, gold, platinum and cadmium etc. These can be reclaimed by shredding e-waste such as mother boards, display units (monitors), processors (CPU) and memory board (RAM) and isolating working and repairable parts and incinerating the nonusable components to obtain metal components.

2. Reuse

1. Some computer components can be reused in assembling new computer products while other can be reduced to metal and can be reused for various applications. Emphasis is being laid to save working and repairable parts including chips, transistors, RAM, etc.

2. Leaded glass from cathode ray tubes (CRTs) is reused in car batteries, ammunition and in foundries as fluxing agent.

Reuse is a better option than recycling because it diminishes the use of fresh products and virgin raw materials, save large quantities of pure water and electricity used in manufacturing will need less packaging units and diminish landfills. From US and other developed countries e-waste is exported to China, Malaysia, India, Kenya, Taiwan and various African countries, for processing. Many surplus laptops are routed to developing nations as "dumping grounds for e-waste". Because of cheap labour rate electronic waste yards have been established. Guiyu in the Shantou region of China is the largest e-waste processing centre. It is called "e-waste capital of the world".

M.C.Q.

1. The pollutants which are already present in nature, but are released in substantial amounts by man are known as

(a) Quantitative pollutants
(b) Qualitative pollutants
(c) Degradable pollutants
(d) Primary pollutants.

2. The biological amplification of DDT in the various trophic levels is known as

(a) Greenhouse effect
(b) Biomagnification
(c) Eutrophication
(d) Pollution.

3. Smog is produced due to

(a) Air and metal dust
(b) Water and nitrogen oxide
(c) Smoke and fog
(d) None of the above.

4. The photochemical smog is formed by

(a) Nitrogen oxides
(b) Hydrocarbons
(c) Nitrogen oxides and hydrocarbons
(d) Solar radiations upon nitrogen oxides and hydrocarbons.

5. In troposphere O_3 promotes

(a) Oxidation of biochemicals
(b) Destruction of chlorenchyma
(c) Both a and b
(d) Growth of plants.

6. In metropolitan cities the automobiles cause air pollution

(a) 80% (b) 60% (c) 50% (d) 100%.

7. **Bhopal gas tragedy was due to**
(a) Air pollution (b) Soil pollution
(c) Water pollution (d) None of the above.

8. **Maximum air pollution is at**
(a) Delhi (b) Bhopal (c) Kolkata (d) Bangalore.

9. **Huge quantity of sewage is dumped in a river. The BOD will**
(a) Increase (b) Decrease
(c) Slightly decrease (d) Remain unchanged.

10. **Jet aeroplane releases pollutants in air called**
(a) Smog (b) Photo-chemical oxidants
(c) Aerosols (d) Algae and bacteria.

11. **Fertilizers, pesticides and insecticides may cause**
(a) Air pollution (b) Water pollution (c) Both a and b (d) None of the abo

12. **The gas released in Bhopal tragedy was**
(a) MIC (b) $COCl_2$ (c) Phosgene (d) None of the abo

13. **Pollutants directly emanating from human activities are**
(a) Quantitative pollutants (b) Qualitative pollutants
(c) Air pollutants (d) Water pollutants.

14. **Atmospheric pollutants formed by human activities constitute of the tota**
(a) 95% (b) 75% (c) 25% (d) 0.05%.

15. **Most atmospheric pollutants do not rise above**
(a) 600 m (b) 1000 m (c) 2000 m (d) 200 m.

16. **Aerosol is a system of colloidal particles having a size of**
(a) 5 μm (b) 1 – 2 μm (c) Less than 1 μm (d) More than 10 μm

17. **A secondary pollutant is**
(a) O_3 (b) CO (c) CH_4 (d) Pb.

18. **A colourless, non-irritant, highly toxic gas that impairs respiration is**
(a) SO_2 (b) NO_2 (c) CO_2 (d) CO.

19. **Lead pollution in Indian cities had been mainly due to**
(a) Lead pencils (b) Batteries (c) Automobiles (d) Electronic gadget

20. **Pollutant likely to deplete ozone layer is**
(a) CO (b) Nitrogen oxides
(c) Chlorofluorocarbons (d) Both b and c.

21. **Acid rain is caused by**
(a) Excess production of coal gas
(b) Excess release of CO_2 due to increasing combustion and respiration
(c) Excess release of SO_2 and NO_2 from burning fossil fuels
(d) Excess production of gaseous hydrocarbons.

22. **SO_2 pollution is indicated by destruction of**
(a) Climbers (b) Lichens (c) Mosses (d) Grasses.

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23. **Freon is**
(a) Ferrous sulphide pollutant (b) Chlorofluorocarbon
(c) Iron containing polycyclic hydrocarbons (d) Metal fluoride.

24. **Maximum atmospheric NO_2 pollution is found in**
(a) Baroda/Vadodar (b) Chennai (c) Nagpur (d) Mumbai.

25. **Photochemical smog brings about**
(a) Defoliation (b) Bleaching and blaring of foliage
(c) Floral bud shedding (d) Discolouration and curling of petals.

26. **Water-soaked appearance of leaves due to sulphur dioxide pollution is caused by**
(a) Destruction of chlorophyll (b) Damage to membranes
(c) Both a and b (d) Corrosive action over metals.

27. **In addition to SO_2, metals and textiles are damaged by**
(a) Nitrogen oxides (b) Fluorides (c) Carbon monoxide (d) Aldehydes.

28. **Photochemical reaction of nitrogen oxides with unsaturated hydrocarbons produces**
(a) Methyl isocyanate (b) Phosgene
(c) Benzopyrene (d) Peroxyacetyl nitrates.

29. **Level of atmospheric CO_2 has increased from**
(a) 220 ppm to 360 ppm (b) 250 ppm to 300 ppm
(c) 300 ppm to 340 ppm (d) 330 ppm to 350 ppm.

30. **Gravity settling tanks/porous filters are used to remove particles larger than**
(a) 2 μm (b) 50 μm (c) 20 μm (d) 10 μm

31. **Electrostatic precipitators are employed to remove particulate pollutants of the size of**
(a) 5-20 μm (b) 20-50 μm (c) 50 μm and larger (d) 0.5 – 5.0 μm

32. **B.O.D. is related to**
(a) Detergents (b) Putrescibility (c) Inorganic pollutants (d) Organic pollutants.

33. **A persistent insecticide is**
(a) Organophosphates (b) Carbamates
(c) Thiocarbamates (d) Chlorinated hydrocarbons.

34. **An organochlorine insecticide is**
(a) DDT/aldrin (b) Malathion
(c) Tetraethyl pyrophosphate (d) Thiocarbamate.

35. **Domestic waste is**
(a) Effluent (b) Biodegradable (c) Nonbiodegradable (d) Air pollutant.

36. The first atomic bomb was thrown over
(a) Nagasaki (b) Hiroshima (c) Tokyo (d) Hong Kong.

37. Atomic bomb was used during World War-II in
(a) 1941 (b) 1939 (c) 1943 (d) 1945.

38. At atomic explosion has the ability to make radioactive material
(a) Iodine-131 (b) Cesium-137 (c) Strontium-90 (d) All of the abov

39. The most significant attribute of noise is its
(a) Duration (b) Unpleasant nature
(c) Loudness (d) Frequency

40. Loud noise causes
(a) Irritation (b) Irrationality
(c) Impairment of hearing (d) Dilation of blood vessels

41. The first effect of noise is
(a) Constriction of blood vessels (b) Anxiety and stress reactions
(c) Increased heart beat (d) Digestive spasm.

42. Climate of the world is threatened by
(a) Increasing concentration of atmospheric oxygen
(b) Decreasing amount of atmospheric oxygen
(c) Increasing amount of atmospheric carbon dioxide
(d) Decreasing amount of atmospheric carbon dioxide.

43. Green-house gases are
(a) Absorbers of long-wave radiations from earth
(b) Transparent to both solar radiations and long-wave radiations from earth
(c) Absorbers of solar radiations for warming the atmosphere of earth
(d) Transparent to emissions from earth for passage into outer space

44. Earth is protected from ultra-violet radiations by means of
(a) Ozone layer (b) Nitrogen (c) Oxygen (d) Carbon dioxide.

45. Ozone layer occurs in
(a) Ionosphere (b) Stratosphere (c) Thermosphere (d) Troposphere.

46. Global warming will cause
(a) Rise in level of oceans (b) Decrease in glaciers
(c) Reduction in ice caps (d) All the above.

47. Etching of marble, limestone, jewellery, etc. is caused by pollutant
(a) CO_2 (b) CO (c) SO_2 (d) CH_4

48. Cyclone collectors and electrostatic precipitators are meant for controllin
(a) Sewage pollution (b) Air pollution
(c) Pesticide pollution (d) Natural pollution.

49. **Photochemical smog was first observed in**
(a) Los Angeles (b) Tokyo (c) New York (d) Sydney

50. **Classical smog was first observed in**
(a) Tokyo (b) New York (c) Sydney (d) London

51. **Acid rain is due to**
(a) Water pollution (b) Air pollution
(c) Automobile pollution (d) Pesticide pollution

52. **Non-biodegradable pollutants are extremely harmful because they**
(a) Undergo biomagnification (b) Remain in position for long
(c) Do not get recycled (d) Both b and c

53. **Primary pollutant is the one which**
(a) Enters environment directly (b) Is formed naturally
(c) Is the by-product of reactions between two or more pollutant components
(d) Is anthropogenic

54. **A primary air pollutant is**
(a) CH_4 (b) H_2S (c) CO (d) All of the above

55. **A pollutant that causes irritation in eyes, throat and nose**
(a) CO (b) SO_2 (c) CH_4 (d) Chlorofluorocarbons

56. **Pulmonary oedema is caused by**
(a) Sulphur oxides (b) Carbon oxides (c) Nitrogen oxides (d) Hydrocarbons

57. **In thermal inversion**
(a) Warm ground air gets overlapped by cool air
(b) Cool ground air gets overlapped by warm air
(c) Ground temperature becomes high in winter
(d) Ground temperature becomes low in summer

58. **After thermal inversion, pollutants pile up in**
(a) Hanging cool air (b) Hanging warm air
(c) At the boundary of cool and warm airs (d) Soil

59. **In India 50% of all sickness and 30% of all deaths occur due to polluted and contaminated**
(a) Soil (b) Air (c) Water (d) Industries

60. **Detergents are water pollutants because they contain**
(a) Sulphates (b) Nitrates (c) Carbonates (d) Phosphates

61. **Eutrophication of waterbody occurs due to addition of**
(a) Detergents (b) Fertilisers (c) Sewage (d) All of the above

62. **Air and water pollution are interconnected through**
(a) Smog (b) Acid rain (c) Aerosols (d) Radioactive pollution

63. **Aerosol is a suspension of**

(a) Liquid drops in air (b) Solid particles in air

(c) Liquid or solid particles of less than 1·0 μm

(d) Liquid or solid particles of more than 1·0 μm.

64. **Ozone present in stratosphere comes from**

(a) Photosynthetic activity from earth

(b) Reaction between nitrogen oxides and O_2

(c) Photochemical interactions of oxygen molecules

(d) Microbial decay on earth

65. **In pollution, the term synergism is used for**

(a) Biomagnification of non-degradable pollutants

(b) Dangerous effect when two pollutants are present together

(c) Decreasing effect to a degradable pollutant

(d) Formation of more potent secondary pollutant from primary pollutants

66. **Oil slick causes mass scale death of fish due to**

(a) Clogging of gills (b) Non-availability of oxygen in water

(c) Non-availability of food (d) Disruption of food-chain

67. **Ozone hole is widest over**

(a) Equator (b) North pole (c) North temperate area (d) Antarctica

68. **Two components of automobile exhausts which can interact to produce secondary pollutants are**

(a) Carbon monoxide and nitrogen oxides (b) Nitrogen oxides and hydrocarbons

(c) Carbon dioxide and sulphur dioxide (d) Sulphur and nitrogen oxides.

69. **SPM causes**

(a) Respiratory diseases (b) Bone deformities

(c) Skin diseases (d) All of the above.

70. **Corrosion of statutes and monuments occurs due to**

(a) Photochemical smog (b) Carbon monoxide (c) Acid Rain (d) Methane

71. **Combustion of coal forms**

(a) Sulphur oxides (b) Nitrogen oxides (c) Carbon oxides (d) All the above

72. **Where was the painful bone disease itai-itai reported first ?**

(a) Britain (b) India (c) Japan (d) USA

73. **Which one the following is not a green house gas ?**

(a) CO_2 (b) CH_4 (c) O_2 (d) CFCs

74. **UV radiations in the stratosphere are absorbed by**

(a) Oxygen (b) Ozone (c) Sulphur dioxide (d) Argon

75. **Montreal Protocol was signed in**

(a) 1978 (b) 1987 (c) 1991 (d) 1993

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76. **Earth Summit 1992 was held at**

(a) Rio-de-Janeiro (b) Stockholm (c) New York (d) Geneva

77. **World Environment Day is**

(a) 22nd December (b) 1st May (c) 6th February (d) 5th June

78. **World Environment Day coincides with the commemoration of**

(a) Montreal Protocol (b) Vienna Convention

(c) First United Nations Conference on Human Environment

(d) Helisinki Declaration

79. **Part of ozone is destroyed over poles during**

(a) Polar spring (b) Winter (c) Summer (d) Period of snowfall

80. **Ozone present in stratosphere filters out**

(a) UV-A (b) UV-B (c) UV-C (d) All of the above

81. **Ozone hole over Antarctica was first detected by**

(a) Molina and Rowland (b) Farman *et al* (c) Augus (d) Molina and Molina

82. **Ozone hole over Antarctica appears during**

(a) August-September (b) March-April

(c) October-November (d) January-February

83. **ODS means**

(a) Ozone developing substance (b) Ozone depleting substance

(c) Ozone data source (d) Office data secrecy

84. **CFCs split up in stratosphere to release chlorine by the action of**

(a) UV–A (b) UV–B (c) UV – C (d) All the above

85. **The reaction in which the same chemical reacts again and again with the substrate is**

(a) Catalytic (b) Enzymatic (c) Chainamictic (d) Both a and b

86. **Ozone depletion shall cause higher incidence of**

(a) Skin cancers (b) Cataract (c) Decreased immunity (d) All the above

87. **Montreal Protocol was connected with**

(a) Phasing out ODS (b) Reduction in CFCs

(c) Replacing CFCs with Chlorine and Bromine (d) All the above

88. **Kyoto Conference is connected with**

(a) Limiting production of CO_2 (b) Developing alternatives to ODS

(c) Both a and b (d) Reduction in use of energy

89. **In the absence of greenhouse gases, the temperature of earth's surface will fall to**

(a) 0°C (b) – 5°C (c) – 10°C (d) – 20°C

90. **Surface of earth is kept warm by**

(a) Solar radiations (b) Geothermal energy

(c) Greenhouse flux

(d) Absorption of infra-red radiations by greenhouse gases

91. Noise was recognised as air pollutant through amendment of
(a) Environment (Protection) Act
(b) Air (Prevention and control of pollution) Act
(c) Noise (Control and Pollution) Act (d) All the above

92. Carbon dioxide fertilisation effect is
(a) Warming effect of CO_2
(b) Photosynthetic enhancement of elevated CO_2 level
(c) Both summer and winter rainfall of higher latitudes
(d) Poleward shifting of temperate zone.

93. Black Foot disease in humans is caused by
(a) Arsenic (b) SPM (c) Fluorine (d) Cadmium

94. Blue baby syndrome is caused by pollution by
(a) CO (b) Fluorine (c) Nitrate (d) Mercury

95. At DO below 4 mg/l, water at normal temperature is
(a) Heavily polluted (b) Moderately polluted
(c) Little polluted (d) Nearly pure

96. National Institute of Oceanography is located at
(a) Mumbai (b) Panaji (c) Madras (d) Lucknow

97. Ecological balance of a mining area is restored through
(a) Conversion into agricultural area (b) Revegetation of area
(c) Prevention of soil erosion (d) Protection against grazing

98. Major aerosol pollutant in jet plane emission is
(a) Sulphur dioxide (b) Carbon monoxide (c) Methane (d) Fluorocarbon

99. Terrestrial life would become impossible with
(a) Change in orbit of earth
(b) Change in atmosphere permitting all solar radiations to reach lithosphere
(c) Disappearance of moon
(d) Decrease in mean annual temperature by 10°C

100. Disease aggravated by pollution is
(a) Scurvy (b) Rheumatism (c) Haemophillia (d) Bronchitis

101. Atmosphere of big/metropolitan cities is polluted most by
(a) Automobile exhausts (b) Pesticide residue
(c) Household waste (d) Radio-active fall-out.

102. Chief air pollutant which is likely to deplete ozone layer is
(a) Sulphur dioxide (b) Carbon dioxide
(c) Carbon monoxide (d) Nitrogen oxides and fluorocarbons.

103. Which one is not a pollutant normally ?
(a) Hydrocarbons (b) Carbon dioxide (c) Carbon monoxide (d) Sulphur dioxide.

104. Gas released during Bhopal tragedy was
(a) Methyl isocyanate (b) Potassium isothiocyanate
(c) Sodium isothiocyanate (d) Ethyl isothiocyanate.

105. Minamata disease is due to pollution of
(a) Organic waste into drinking water (b) Oil spill in water
(c) Industrial waste mercury into fishing water (d) Arsenic into the atmosphere

106. Cyclone collector is used for minimising
(a) Radioactive pollution (b) Air pollution
(c) Noise pollution (d) Water pollution.

107. Ultra-violet light causes
(a) Formation of pyrimidines (b) Sticky metaphases
(c) Photodynamic action
(d) Destruction of hydrogen bonds between complementary DNA strands.

108. Sulphur dioxide affects
(a) Cell wall (b) Plasmodesmata (c) All membrane systems (d) Nucleus.

109. Addition of phosphates and nitrates/fertilizers into water leads to
(a) Increased growth of decomposers (b) Reduced algal growth
(c) Increased algal growth (d) Nutrient enrichment/Eutrophication.

110. Pollution produces necrosis or chlorosis of
(a) Leaf margin and tip (b) Stem (c) Petiole but not lamina (d) Midrib

111. Air pollution is maximum in
(a) Sewage and pesticides (b) Sewage and effluents
(c) Detergents and pesticides
(d) Automobile exhausts and chemicals from industries.

112. Air pollutant photochemical oxidants include
(a) Nitrous oxide, nitric acid and nitric oxide
(b) Oxygen, chlorine and nitric acid
(c) Ozone, peroxyacetyl nitrate and aldehydes
(d) Carbon monoxide and sulphur dioxide.

113. Ultraviolet radiations are lethal because of inactivation of
(a) Proteins, nucleic acids and pigments (b) Minerals, air and water
(c) Carbohydrates, fats and vitamins (d) Water, carbon dioxide and oxygen.

114. Pollutant of automobile exhausts that affects nervous system/produces mental diseases is
(a) Mercury (b) Lead (c) Nitrogen oxide (d) Sulphur oxide.

115. SO_2 and NO_2 produce pollution by increasing
(a) Alkalinity (b) Acidity (c) Neutrality (d) Buffer action.

116. Non-ionising radiations with specific biological effects are

(a) UV radiations (b) Beta-rays (c) Gamma rays (d) X-rays.

117. Carbon monoxide is a pollutant as it

(a) Inactivates nerves (b) Inhibits glycolysis

(c) Combines with oxygen (d) Combines with haemoglobin.

118. Air pollutants that produce photochemical oxidants include

(a) CO_2, CO and SO_2 (b) Nitrous oxide, nitric oxide and nitric

(c) Oxygen, chlorine and nitric acid (d) Ozone, chlorine and sulphur dioxide.

119. Acid rains are produced by

(a) Excess NO_2 and SO_2 from burning fossil fuels

(b) Excess production of NH_3 by industry and coal gas

(c) Excess release of carbon monoxide by incomplete combustion

(d) Excess formation of CO_2 by combustion and animal respiration.

120. Spraying of DDT produces pollution of

(a) Air (b) Air and water (c) Air and soil (d) Air, water and

121. Most abundant water pollutant is

(a) Detergents (b) Pesticides (c) Industrial wastes (d) Ammonia.

122. Atmospheric pollutant is

(a) CO_2 (b) CO (c) O_2 (d) N_2.

123. Atmospheric content of CO_2 is

(a) 0·0036% (b) 0·036% (c) 0·36% (d) 3·6%

124. Burning of fossil fuels is the main source of a-pollution

(a) Nitrogen oxide (b) Nitric oxide (c) Nitrous oxide (d) Sulphur dioxide.

125. Modes of controlling pollution in large cities include

(a) Cleanliness and less use of insecticides

(b) Proper disposal of organic wastes, sewage and industrial effluents

(c) Broader roads and shifting of factories out of the residential areas

(d) All the above.

126. Domestic waste constitutes

(a) Non-biodegradable pollution (b) Biodegradable pollution

(c) Effluents (d) Air pollution.

127. National Environmental Planning Engineering Organisation at Nagpur

(a) NEERI (b) CPHER (c) ICAR (d) CSIR.

128. Ozone layer of upper atmosphere is being destroyed by

(a) Chlorofluorocarbon (b) SO_2

(c) Photochemical oxidants/O_3 and CO_2 (d) Smog.

129. SO_2 pollution is indicated by

(a) Deschampsia (grases) (b) Sphagnum (mosses)

(c) Usnea (lichens) (d) Cucurbita (climbers).

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130. Increased asthmatic attacks in certain seasons are related to

(a) Inhalation of seasonal pollen (b) Eating of seasonal vegetables

(c) Low temperatur (d) Wet and dry environment.

131. Ozone depletion in stratosphere shall result in

(a) Forest fires (b) Increased incidence of skin cancer

(c) Global warming (d) None of the above.

132. Which one of the following dissolves more rapidly in blood haemoglobin than oxygen ?

(a) Ozone (b) Nitrous oxide (c) Sulphur dioxide (d) Carbon monoxide.

133. Which of the following forms a toxic substance in blood by combining with haemoglobin?

(a) Carbon dioxide (b) Carbon monoxide (c) Oxygen (d) Methane

134. DDT is

(a) Greenhouse gas (b) Degradable pollutant

(c) Non-degradable pollutant (d) None of the above.

135. Ultraviolet radiations from sunlight causes reaction that produces

(a) Fluorides (b) Carbon monoxide (c) Sulphur dioxide (d) Ozone.

136. The most polluted city of the world is

(a) New York (b) Tokyo (c) Mexico (d) Kolkata.

137. Noise pollution is measured in

(a) Hertz (b) Fathoms (c) Nanometres (d) Decibels.

138. Most hazardous metal pollutant of automobile exhausts is

(a) Mercury (b) Cadmium (c) Lead (d) Copper.

139. Beauty of Taj may be destroyed by

(a) Flood in Yamuna (b) Temperature mediated spoilage of marble

(c) Air pollutants from Mathura refiner (d) All the above.

140. Smog occurs in places of

(a) Excess SO_2 (b) Low temperature

(c) High temperature (d) Excess NH_3

141. Which is not a pollutant from exhaust of motor vehicle ?

(a) Hydrocarbon gas (b) Fly-ash (c) SO_2 (d) CO.

142. Acid rain is due to increase in atmospheric concentration of

(a) Ozone and dust (b) CO_2 and CO (c) SO_3 and CO (d) SO_2 and NO_2.

143. Major pollution-causing agent is

(a) Hydrocarbons (b) Animals (c) Man (d) None of the above.

144. Major air pollutants in Mumbai and Kolkata are

(a) Marsh gas and algal spores (b) O_3

(c) Hydrocarbons and hot air (d) CO and oxides of sulphur.

145. Pollution is

(a) Removal of top soil

(b) Release of toxic/undesirable materials in environment

(c) Conservation of energy (d) All the above.

146. Effect of pollution is most marked on

(a) Natural balance of nature (b) Natural geochemical cycles

(c) Natural flora of a place (d) All the above.

147. Chief source of water and soil pollution is

(a) Mining (b) Thermal power plant (c) Agro industry (d) All the above

148. Ultimate environmental hazard to mankind is due to

(a) Nuclear pollution (b) Water pollution (c) Air pollution (d) Noise pollution

149. Strontium of radio-active fall out is

(a) Sr-90 (b) Sr-95 (c) Sr-85 (d) Sr-80.

150. Effect of to-day's radioactive fall-out will be more on future children than children living to-day due to

(a) Infant susceptibility to radiations

(b) Increase of susceptibility to radiations with age

(c) Mutated genes which are usually recessive (d) Radiations have delayed effect

151. Lead is

(a) Air pollutant (b) Soil pollutant (c) Radioactive pollutant (d) Noise pollutant

152. Which will not cause atmospheric pollution?

(a) SO_2 (b) CO_2 (c) CO (d) H_2.

153. Which causes water pollution ?

(a) Smoke/fly-ash (b) Automobile exhausts (c) Aeroplanes (d) 2,4-D and pesticides

154. Pollution is controlled by

(a) Banning atomic blasts (b) Use of electrically operated automobiles

(c) Sewage treatment (d) All the above.

155. Air pollution is not caused by

(a) Pollen grains (b) Hydroelectric power (c) Industries (d) Automobiles.

156. Carbon monoxide is harmful to human beings as it is

(a) Carcinogenic (b) Antagonistic to CO_2

(c) with higher affinity for haemoglobin as compared to oxygen

(d) Destructive to O_2.

157. Highest DDT deposition shall occur in

(a) Phytoplankton (b) Sea Gull/Birds (c) Crab (d) Eel.

158. Gas being produced by paddy fields and involved in global warming is

(a) Chlorine (b) Methane (c) CO_2 (d) H_2S.

159. Greenhouse effect is warming due to

(a) Infra-red rays reaching earth (b) Moisture layer in atmosphere

(c) Increase in temperature due to increase in carbon dioxide concentration of atmosphere

(d) Greenhouse gas like ozone layer.

160. The blue baby syndrome is caused by the contamination of water due to—

(a) Phosphate (b) Arsenic (c) Nitrate.

161. The most important air pollutant for petrol cars is—

(a) CO_2 (b) SO_2 (c) Hydrocarbons.

162. Bhopal gas tragedy the occurred due to leakage of—

(a) Methyl isocyanate (b) Sulphur dioxide (c) NO_2

163. The water-body with very high nutrient-content is known as—

(a) Mesotrophic (b) Oligotrophic (c) Eutrophic.

164. The book written by Rachel Carson is—

(a) Silent Spring (b) The Voyage of the Beagle (c) The Old Man and the Sea.

ANSWERS

1. (c) 2. (b) 3. (c) 4. (d) 5. (c) 6. (a) 7. (a) 8. (c) 9. (a) 10. (c) 11. (c) 12. (a) 13. (b)
14. (d) 15. (a) 16. (c) 17. (a) 18. (d) 19. (c) 20. (d) 21. (c) 22. (b) 23. (b) 24. (a)
25. (b) 26. (c) 27. (a) 28. (d) 29. (a) 30. (b) 31. (a) 32. (d) 33. (d) 34. (a) 35. (b)
36. (b) 37. (d) 38. (d) 39. (c) 40. (c) 41. (b) 42. (c) 43. (a) 44. (a) 45. (b) 46. (d)
47. (c) 48. (b) 49. (a) 50. (d) 51. (b) 52. (a) 53. (a) 54. (d) 55. (b) 56. (c) 57. (b)
58. (a) 59. (c) 60. (d) 61. (d) 62. (b) 63. (c) 64. (c) 65. (d) 66. (a) 67. (d) 68. (b)
69. (a) 70. (c) 71. (d) 72. (c) 73. (c) 74. (b) 75. (b) 76. (a) 77. (d) 78. (c) 79. (a)
80. (b) 81. (b) 82. (a) 83. (b) 84. (c) 85. (c) 86. (d) 87. (b) 88. (c) 89. (d) 90. (c)
91. (b) 92. (b) 93. (a) 94. (c) 95. (a) 96. (b) 97. (b) 98. (d) 99. (b) 100. (d) 101. (a)
102. (d) 103. (b) 104. (a) 105. (c) 106. (b) 107. (d) 108. (c) 109. (d) 110. (a)
111. (d) 112. (c) 113. (a) 114. (b) 115. (b) 116. (a) 117. (d) 118 (b) 119. (a) 120. (d)
121. (c) 122. (b) 123. (b) 124. (d) 125. (d) 126. (b) 127. (a) 128. (a) 129. (c) 130. (a)
131. (b) 132. (d) 133. (b) 134. (c) 135. (d) 136. (b) 137. (d) 138. (c) 139. (c) 140. (a)
141. (b) 142. (d) 143. (c) 144. (d) 145. (b) 146. (a) 147. (d) 148. (a) 149. (a) 150. (c)
151. (b) 152. (d) 153. (d) 154. (d) 155. (b) 156. (c) 157. (d) 158. (b) 159. (c) 160. (c)
161. (c) 162. (a) 163. (c) 164. (a)

Fill up the blanks :

Q.1. Diarrhoea is a——born disease and caoused by bacteria.
Ans. Water.

Q.2. The causative agents of. Tuberculosis and mumps are——and —.
Ans. Bacteria, virus.

Q.3. The most important gas creating the Green House effect are —— and
Ans. Carbon dioxide, Methane.

Q.5. —— is an example of non-biodegradable waste.
Ans. DDT.

Q.6. —— is an example of green house gas.
Ans. Carbon dioxide.

Q.7. Malaria is a disease caused by ——
Ans. Plasmodium.

Q.8. The painful disease 'Itai-itai byo', Which broke out in Japan, causes extreme weakening of bones. This disease is related to the toxic of —
Ans. Cadmium.

Q.9. The decibel limit in silence zone is between ——.
Ans. 40-50 dB.

Q.10. Cancer causing sustances are called ——.
Ans. Carcinogen.

Q.11. Rat Flea carries causative agent for ——
Ans. Plague.

Q.12. Govt. recommended standard of SPM in air is ——
Ans. 140 ug/M^3.

Q.13. —— is one of the reasons for global warming.
Ans. Co_2 emissions

Q.14. —— is one of the fall-outs of Ozone layer depletion.
Ans. Skin Cancer.

Q.15. —— is one of the causal factors for sea level rise.
Ans. global warming.

Q.16. —— of the atmosphere protects us from the ultraviolet rays of the sun.
Ans. ozone layer.

Q.17. Profit maximization of business —— environmental degradation.
Ans. helps.

Q.18. Asbestos causes——disease in human body.
Ans. silicosis.

Q.19. —— is pollutant comes out of the decomposed organic substance.
Ans. Hydrocarbon (mainly terpens) and H_2S.

Q.20. Malaria is a —— borne disease.
Ans. vector.

Q.21. —— is a cause of environmental pollution.
Ans. Industrial effluents.

Q.22. Bhopal gas disaster ocurred in the year——.
Ans. 1984.

Q.23. CFC stands for——.
Ans. Chloro-fluro carbon.

Q.24. —— is a water-borne disease.
Ans. Cholera.

Q.25. — is used for measuring the intensity level or noise.
Ans. Decibel.

Q.26. Montreal Protocol in 1987 targetted 50% cuts in——use.
Ans. CFC.

Q.27. Tuberculosis is caused by —— bacteria.
Ans. Mycobacterium tuberculosis.

Q.28. LD_{50} is measure of —— and PM_{10} is a measure of ——.
Ans. Toxic response of Toxicant (Pesticides), water pollution.

Q.29. The term Lc_{50} in water pollution means ——.
Ans. Lethal concentration at which 50% of auqative animals die.

Q.30. "Itai-itali" is a disease associated with —— pollution.
Ans. Mercury.

Q.31. Two important hydel projects in Eastern India are — and——.
Ans. D.VC,. Taicher Dam.

Q.32. Two important green house gases are —— and —.
Ans. carbon dioxide, methane.

Q.33. Decibel is a unit for measuring ——.
Ans. noise pollution.

Q.34. El Nino is a——phenomenon connected with——,——
Ans. natural, warming of ocean surface.

Q.35. Ozone is a pollutant gas on the surface of the——but high up it —— life below.
Ans. Earth, protects.

Q.36. —— is the main contributor gas for global warming.

Ans. Carbon dioxide.

Q.37. Earthquake is a —— hazard.

Ans. Natural.

Q.38. Typhoid is a —— borne disease.

Ans. water.

Q.39. Toxic effect causes ——disease.

Ans. various

Q.40. The permissible level of sound pollution is——.

Ans. 60 decibel.

Q.41. Acid rain is caused by the presence of —— and —— acids in ra water.

Ans. Sulphuric and nitric.

Q.42. C —— F —— Carbon.

Ans. Chloro Fluro Carbon.

Q.43. Environmental monitoring involving living system is called ——.

Ans. biological control.

Q.44. B —— O —— D ——.

Ans. Biological Oxygen Demand.

Q.45. Ozone depletion cause —— cancer.

Ans. skin.

Q.46. Silicosis causes —— of lungs.

Ans. Cancer.

Q.47. River water are polluted by —— waste.

Ans. industrial.

Q.48. The Cause of Bhopal gas Tragedy was due to——.

Ans. MIC (methyl isocyanate)

Q.49. Noise pollution Causes —— of hearing.

Ans. Impairment,

Q.50. —— is the most polluted city in the world.

Ans. Mexico.

Q.51. CO is a —— air pollutant and PAN is a —— air pollutant.

Ans. Participate, secondary.

Q.52. —— is responsible for green house effect and —— is responsible for ozone-hole formation!

Ans. Carbon dioxide, CFC.

Q.53. The two important ingredients of acid rain are —— and ——.

Ans. So_2, NO_2

Q.54. The full forms of BOD and COD are —— and —— respectively.

Ans. Biological oxygen demand, Chemical oxygen demand.

Q.55. NTPC stands for ——.

Ans. National Thermal Power Corporation.

Q.56. Carbon Monoxide (Co), is a —— air pollutant.

Ans. Particular.

Q.57. PAN is a —— air pollutant

Ans. Secondary. El-Nino originates

Q.58. ~~Elnino 01~~ igiuates from the —— Coast

Ans. South American.

Q.59. —— is one of the sources water pollution.

Ans. Detergant.

Q.60 —— P —— C —— C

Ans. International Pollution Control Commission.

Very Short Answer type Questions

Q.1. What do you understand by air pollution?

Ans. Air pollution is mixing of some substances in the ambient air in such concentrations hat a situation arises in which man and his environment is badly affected.— —WHO.

Q.2. State one reason of controling Ganga Pollution

Ans. The main objective of the Ganga Action plan is to achieve the bathing water quality standard of Dissolved oxygen of Sing/liter minimum and BOD of 3mg/liter, maximum wer stretch of the river.

Q.3. Give the name of a gas which is principally responsible for 'greenhouse effect'.

Ans. Carbon-dioxide (CO_2)

Q.4. What is cyclone?

Ans. The air above the ocean becomes very much warmed due to direct sunlight, the warmed moist air is light it starts rising and the pressure of the region declines creating a ow pressure zone which pulls more warm air from the surroundings and forms a spiral weather system, called cyclone.

Q.5. Write down the name of a source of fly ash?

Ans. Thermal Power plants. (Kolaghat, Bandel).

Q.6. Mention a major earthquake accurred in India.

Ans. On 26th January 2001 at 8-30 am a major earthquake occured in the district of Bhuj, Baroda of Gujrat.

Q.7. Write down the names of two greenhouse gases.

Ans. Carbon dio-oxide (CO_2) and Chlorofiuro carbon (CFC).

Q.8. What is MIC?

Ans. MIC means Methyl isocyanate. It is a toxic gas, an intermediate product of a common pesticide, Sevin. On 3rd December, 1984 in Blopal, world's most destructive gas pollution occured due to the escape of MIC gas.

Q.9. What is dose limit?

Ans. The concentration of toxic agent at which the intensity of toxic response is maximum.

Q.10. What do you mean by PAN!

Ans. PAN = Peroxy Acetyle nitrate. During Photochemical smog formation a series of Complex reaction occur and as a result secondary pollutants are produced. PAN is one of the secondary Pollutants.

Q.11. What is the maximum limit of arsenic prescribed by WHO?

Ans. 0.05 mg/liter of drinking water.

Q.12. Who were the worst sufficres in Bhopal gas disaster?

Ans. The people of the surrounding 40 sqkm. area of Union carbide Company, Bhopal who were sleeping at night on December 3, 1984

Q.13. Name four harmful gases present in the auto exhaust emission.

Ans. Carbon monoxide (Co), Oxides of Nitrogen (NO, N_2O, NO_2), Hydro Carbon, Sulphur dioxide.

Q.14. What is environmental Hazards?

Ans. The extreme events of the earth either natural or man induced ; Which cross the tolerable limits, make recovery difficult and results in catastrophic losses of lives and properties.

Q.15. Name the Instruments used to measure noise pollution.

Ans. Sound meter (By decible unit)

Q.16. What is the meanmg of the term 'hazardous substance' as per environmental protection act, 1986?

Ans. 'Hazardous substance' means any substance or preparation which, by means of its chemical or physicochemical properties or handling, is liable to cause harms to human beings, other living creatures, property or the environment.

Q.17. What is deci Bel?

Ans. The Unit of measurement of noise is decibel (dB) named after Alexander Graham Bell. The larger Unit is Bel (B). 1 decibel = $\frac{1}{10}$ Bel

A Decibel is equal to the faintest sound that can be heard by the human ear.

Q.18. Which gas in the atmosphesre is the major cause of acid rain?

Ans. Sulphur dioxide (SO_2)

Q.19. Which element was responsible for Minamata episode ?

Ans. Mercury.

Q.20. What was responsible for Chernobyl disaster ?

Ans. Nuclear plant disaster, the radioactive substances were responsible.

Q.21. Write names of two air borne diseases ?

Ans. Tuberculosis, Influenza.

Q.22. What is the permissible limit of lead in drinking water as per WHO?

Ans. 0.05 mg per liter.

Q.23. What is the full form of SPCB ?

Ans. State Pollution control Board

Q.24. What is the full form of DDT ?

Ans. Dichloro diphenyl trichloro ethene

Q.25. What is the full form of CPCB ?

Ans. Central pollution Control Board.

Q.26. Who can constitute the "State Pollution Control Board" and "Central Pollution Control Board"?

Ans. State Govt., on the basis of the 4th Chapter of water presentation and control or pollution Act, 1974, Can constitute the state pollution Control Board and Central Govt on the basis of the 3rd Chapter or water pollution Act Can Consitute central pollution Control Board.

Q.27. What is Bio-accumulation ?

Ans. The phenomenon of accumulation of pollutants inside cells and tissues of living organism from the environment through the biological system is known as Bio-accumulation.

Q.28. What is Smog or photo-chemical smog ?

Ans. In winter season (morning & evening) When Fog and smoke mixed will, chemical pollutents come down to the ground level after photo-Chemical renction is known as smog'.

Short Type Question Answer

Q.1. What are major pollutants emit from automobile ?

Ans. Lead (Pb), oxides of Nitrogen (No, N_2o, No_2), sulphur dioxide (So_2), Hydrocarbon, Carbon monoxide (Co).

Q.2. Mention the sources of lead Pollution and effects on health.

Ans. (i) Auto exhaust, gasoline, paints, storage batteries, pipes.

(ii) Incomplete combustion of disel, petrol. Hwalth effects : Neurotonin affects on blord.

Q.3. What do you mean AIDS and HIV ?

Ans. AIDS (Acquired immune deficiency syndrome) is a disease caused by a retrovirus named HIV (Human immno deficiency virus).

Due to this discease human being loses the immunity power. The virus (HIV) transmi through the blood, infected needle, sexual relationship.

Q.4. What are the principle sources of air pollution in town ?

Ans. (i) Incomplete combustion of fuels (Digel, Petrol. Natural gas),

(ii) Automobile exhausts.

(iii) Combustion of coal used for cooking purpose,

(iv) Industries (fly ash. coal dust etc.).

Q.5. What is Aerosol ?

Ans. The fine paniculate matter in the size range of less than 10 fim produced du combustion of fuel of aeroplanes, industries are known as aerosol.

Q.6. What is suspended particulate matter ?

Ans. Particulate matters or collodial substances which are present in the air may be the free flowing state known as suspended particulate matter. Exp.'Aerosol.

Q.7. Mention the causes of acid rain.

Ans. Acid rains means the presence of excessive acids in rain water. The sulphur nitrogen of coal, Petroleum when burnt in the presence of oxygen are converted into and No_2. During rain these oxides reacts with water vapour to form sulphuric acid nitric acid. The acids when precipitated as rain or snow create acid rain.

Q.8. What is global warming ?

Ans. Warming of the atmosphere is related to the green house phenomenon. The in red radiations are trapped by the green house gases (Co_2, Methane, CFC etc.) or gaseous mentle around the globe. Main cause of global warming is the rise in concentra of the green house gases in the atmosphere which are related to the warming of t atmosphere.

Q.9. What is Minamata disease ?

Ans. Minamata disease aqccured in Minamata Bay in Japan. Mercury accumulated the human body through food chain (fiom affected water to plants, plants to fishes fishes to man). Due to methyl mercury pollution this disease, causes paralysis, loss of ey sight, mental disability and rapid death.

Read the following passages and darken the circle/circles corresponding to the correct statement(s).

Passage 1

Methane is produced mainly in paddy fields and marshy lands by rotting and decomposition (putrefaction) of plants caused by bacteria and under almost anaerobic conditions. It is also produced by the fermentation of urine and faeces of cattle, pigs etc. and due to putrefaction of dead animals under anaerobic conditions. As such, the methane of air comes mainly from organic sources. At present there are about 1.7 parts of methane per million parts of air (1.7 ppm) and its amount in air is increasing by 1.1% per year (rate of increase) on an average. The power of trapping of heat by methane is about 25 times more than that of carbon dioxide moleculewise. But its amount in air being much lower than that of carbon dioxide its, contribution to the green house effect is within 15-20%. Increase in the amount of methane parallels the growth of population. Contribution of methane is next to that of carbon dioxide to the greenhouse effect. India is largely dependent on agriculture and livestock and contributes to the extent of about 14 per cent of the total amount of methane emitted in air.

Statement 1 : In creating greenhouse effect carbon dioxide plays much more important role than methane.

Statement 2 : For global greenhouse effect the farmers and animal herders of India plays an important role.

Statement 3 : Methane and carbon dioxide are the only important elements for creating greenhouse effect.

Ans. ● ● ○
1 2 3

Passage 2

An average man generally breathes 22,000 times a day and intake 16 kg. of air per day. It has been estimated that a man can live for five weeks without food and water, but only for five minutes without air. When the balance among the air components is disturbed or it is polluted then air becomes life-damaging. Much of our knowledge of the effect of air pollution on human health comes from the study on some air-pollution disasters in the world. These disasters indicate how damaging the air pollutions are.

All the pollutants present in the air are not harmful. Depending on the chemical nature and the quantity of the pollutant present in the air and duration of exposure to the human body the effect of the pollutant becomes different.

Statement 1 : A man breathes 16 kg of air per day.

Statement 2 : A man can live for seven weeks without food and water.

Statement 3 : All the pollutants present in this air are not harmful.

Ans. ● ○ ●
1 2 3

Social Issues and The Environment

6.1 CLIMATE CHANGE :

The average temparature of earth surface is about 15°C. The temparature of the earth surface has been increased since the period of civilization of Industrialization. It is expected that the temperature will be increased upto 1·4°C – 5·8°C in the next decade. Due to the effects of green house gases, earthquake, nuclear accidents, cyclone etc. the climate of the earth is ever changing. El nino, La Nino, Southern oscillation etc. are the geographical incidents which are responsible for climate change. Flood, draught, landsides, soil erosion are the results of climate change. Tsunami is one of the agents which are destroying the static condition of climate. The man-made factors are also responsible for the changes.

6.2 OZONE LAYER AND OZONE HOLE :

(a) In 1982, Dr. Jo Foreman, a scientist of British Antarctica survey team, observed the presence of ozone hole at south pole. This was confirmed by the satellite V.S. Nimbus-7 and the measurements were made at the Japanese station 'Swoya'. All these measurements led to the conclusion that a hole had already been punched at an altitude of 15 to 20 km above the Antarctic area. The cause for this large scale depletion of ozone layer was found to be due to the extensive usage of CFC.

Depletion of ozone layer at any region is known as 'ozone hole'.

Causes of depletion of ozone layer : In the naturally occuring chemical reactions in the stratosphere, ozone is destroyed. Sunlight is also responsible for the destruction of ozone layer in natural condition.

Nitrogen oxides which are emitted by the supersonic air transport is found to cause destruction of the ozone layer. Ozone dissociates into oxygen. Nuclear explosions in the atmoshpere also produce large quantities of nitrogen oxides which are added to the stratosphere and are responsible for depletion.

The chlorofluorocarbon (CFC) compounds, commonly called freons, disintigrate or b down in the stratosphere and produce chlorine atoms. These chlorine atoms are h effective in destroying the ozone layer.

It is also conceivable that chlorine, used in drinking water and sewage, may also h some effect on ozone. Methyl fumigated agricultural land, is also believed to be anot source of threat to ozone.

CFCs are mainly responsible for the creation of ozone hole. CFC—type of chemicals used as refrigerants or as aerosol, paints, plastics, foam, thermal insulating materials spray and packaging industries. CFCs are coming into the atmosphere and get disp into atmosphere. Due to photo-chemical reaction CFCs get transformed into HCl HCl gas in presence of ice crystal disintigrates or breaks into chlorine molecules wh dissociate into chlorine atoms. Chlorine atoms react with ozone (O_3) and dissociate oxygen (O_2)

$$CFCl_3 \xrightarrow{UV\text{-}C} CFCl + Cl$$

$$Cl + O_3 \longrightarrow ClO + O_2$$

$$ClO + O_3 \longrightarrow Cl + 2O_2$$

Consequently, chlorofluorocarbons (CFCs) are being replaced by hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HClFCs). Carbon tetrachloride, halon and methyl chloride also deplete ozone by a similar method. Nitric oxide (NO) and other gases which released by jets directly react with ozone to form oxygen.

$$NO + O_3 \longrightarrow NO_2 + O_2$$

(c) Ozone layer covers the earth as a shield in the stratosphereic zone of the atmosphere. It protects all the living beings from the harmful effects of—(uv) rays. Some of the adverse effects of the depletion of ozone layers are as follows :-

UV exposure causes impairment of genetic structure of an individual. Due to the effect of UV, DNA is damaged to a great extent, which is externally manifested in the skin per showing prominent symptoms of skin cancer.

UV exposure shows symptoms of occular damage (cataracts and retinal degeneration)

UV rays also reduce the immunity power in animals and increase susceptibility towards different types of harmful diseases.

Genetic disorders due to UV exposure affect the heredity.

Increased concentration of ultra-violet rays disturb ecological balance in marine eco. system.

Protection of ozone layer :

As the main factors of ozone depletion are CFCs, so ozone layer can be protected by two ways—

1. International programmes should take the necessary steps to reduce CFC.
2. Alternative technologies should be invented to replace use of CFCs.

International programmes to reduce the production of CFCs :-

(i) A review committee was set up in 1977 to collect detailed information on ozone depletion under UNEP.

(ii) To adopt any global programme on the issue, UNEP conveyed one convention in 1985 in Vienna.

(iii) Some countries like USA, Canada, Norway & Sweden decided to control the production of CFCs without waiting for any international laws. These countries agreed to fix the production of CFC-11 & CFC-12 and Sweden announced to stop the production of CFC within 1994.

(iv) Real success in international level on ozone layer protection was achieved in 1987 through Montreal Protocol Convention. 40 Nations took part in the convention and 30 of these nations fully agreed with the decisions. Some relaxations were granted to developing countries like India and China as use of CFCs in these countries is 0.005 gm per capita whereas in developed countries it is more than a kg. Developed countries promised to reduce CFC. It was also agreed that the extra cost in using alternative chemicals to CFCs would be borne by the developed countries.

6.3 GREEN HOUSE GASES AND GLOBAL WARMING

The Green House Effect means "progressive warming up of earth's surface due to the blanketing effect of man-made carbon dioxide in the atmosphere." Some amounts of carbon dioxide and water vapour as well as trace amounts of ozone, methane, nitrous oxide, chloroflurocarbons, and other gases in the troposphere, play a key role in determining the Earth's average temperature and thus, its climate.

The chemical gaseous substances that increase the temperature of the Earth's surface are called green house gases. Three of the four green house gases—carbon di-oxide, nitrous oxide and methane—are emitted by natural as well as human sources. An increase in carbon di-oxide levels, causes more heat which is radiated back to the Earth. This fact warms the planet. The global temperature without the green house effect would be much lower than what they are at present. Major green house gases are—

(1) Carbon di-oxide (CO_2);

(2) Methane (CH_4);

(3) Chloroflurocarbon (CFC);

(4) Nitrous oxide (NO).

(b) Carbon-di-oxide is responsible for more than 55% of the green house effect. Methane is responsible for 20%, CFC is responsible for 15% and NO is responsible for 5% of the green house effect.

The major sources of green house gases are :

(i) Carbon-di-oxide (CO_2)

Source : (1) Due to the burning of fossil fuels.

(2) Level of the gas increases as a consequence of deforestation.

(ii) Methane (CH_4)

Source : (1) Agricultural field of rice and paddies, (2) Burning of wood, (3) Cattle, (4) Wetland, (5) Landfills.

(iii) Chloroflurocarbons (CFC)

Source : Air conditioning industry, foam, packaging industries.

(iv) Nitrous oxide (NO)

Source : (1) Coal burning

(2) Disintigration or breaking-down of chemical fertiliaers

(3) Biomass burning.

(c) Global warming means gradual increase in world temperature caused by green house gases. These gases trap the sun rays in the earth's atmosphere causing the temperature to rise resulting global warming.

Effects of global warming :

Global warming and climate change :

1. If the concentration of green house gases in the atmosphere increases, it will in the average global temperature by 1.51–4.5°C.
2. Level of the sea water would rise by 20-140 cm in various parts of the world to melting of glaciers due to global warming.
3. Increase in temperature would result in evapo-transpiratino phenomenon.
4. Global warming would also affect the rainfall.

Global warming and human disease :

1. The spread of malaria and other tropical disease will increase.
2. The distribution of biting insects and mosquitoes which carry diseases like mal and filaria also change.
3. The life span of the insects will increase.
4. The vector-transmitted disease will increase.

Global warming and agriculture : It will afffect the agricultural activities of yield, cropping pattern, insects, pests and disease.

6.4 ACID RAIN

Acid rain means the presence of excessive acids in rain water. The sulphur and nitrog of coal or petroleum when they are burnt in the presence of oxygen are converted into S and NO_2 respectively. During rain these oxides react with water vapour to form sulphu acid and nitric acid respectively. The acids when get precipitated as rain or snow create a rain.

Acid rain is the effect of air pollution. Every source of energy like coal, fuel wood petrolium products, has sulphur and nitrogen. When these two elements are burnt in th presence of atmospheric oxygen, get converted into oxides—sulphur dioxide and nitrog

dioxide respectively, which are highly soluble in water. During rain these oxides react with large quantities of water vapour of the atmosphere to form their respective acids like sulphuric acid, sulphurous acid, nitric acid and nitrous acid. When the acids get precipitated as rain we call it acid rain.

The common pollutants are sulphur dioxide (SO_2), nitrogen oxides (NO), vol organic carbons (VOCs) and hydrogen chloride (HCl). NO_x are also produced in atmosphere through lightning. Sulphur dioxide and nitrogen oxides are changed in the atmosphere into sulphuric acid and nitric acid respectively by reacting with oxygen and water.

$$2SO_2 + O_2 \longrightarrow 2SO_3 ; SO_3 + H_2O \longrightarrow H_2SO_4$$

$$2No + [O] \longrightarrow N_2O_5 ; N_2O_5 + H_2O \longrightarrow 2HNO_3$$

Acid rain damages plants by direct effect on foliage and growing plants It causes chlorosis, defoliation, dieback etc. It causes also leaching of essential minerals of soil. Toxic minerals which are left in the soil further kill the plants. 50% of natural forests have been destroyed by acid rain in Germany, Sweden, north east U.S.A.., Romania, Poland, etc. Acid rain is also responsible for ruining fresh water reservoirs of industrialised countries. E.g., 80% in Norway, 25% in Sweden, 20% in U.S.A.-pH below 5 kills mostly fish, molluscs, planktons. High acidity dissolves toxic metals like Hg, Pb, Zn, Al etc. Both acidity and the metals are responsible to kill all types of aquatic life except some algae and fungi. On the other hand Acid rain corrodes metals, marine, painted surfaces, slate, stone, etc. This phenomenon is called stone leprosy.

Effects of acid rain on human, Agriculture and Aquatic life.

(1) Acid rain tends to increase acidity in the soil, threatens human and aquatic life, destroys forests and crops reducing agricultural productivity. It causes lot of adverse implications.

(2) Acid rain is able to corrode buildings, monuments, statues, bridges, fences and railings.

(3) It creates a serious threat to human health also, since it contaminates the breathing air, the drinking water and even food.

(4) It can play havoc with the human nervous system by causing neurological diseases. This happens because highly toxic compounds of rains contaminate the potable water and enter our body.

(5) Acidification of soil changes its biology and chemistry. Plants can absorb cadmium more easily in acidified soil and high levels of cadmium in plants are dangerous for animals and human beings. Acid rain in Japan has damaged 5,000 sq. kms of ceder trees in Kanto plain which lies to the North of Takyo.

(6) Acid rain has eliminated fishes in hundreds and thousands at lakes of various countries like USA, Canada and Scandinavian countries like Norway, Sweden, Denmark, Finland, etc.

In the coming days the developing countries like India will soon have to cope up with this problem of acid rain. It is reported that the pH value of rain at the industrial areas of Delhi, Nagpur, Pune, Mumbai and Kolkata is below or close to the critical value.

Average pH value of Acid rain

Kolkata — 5.80
Hyderabad — 5.73
Chennai — 5.85
Delhi — 6.21
Mumbai — 4.80

Control measures

The suggestive control measures are as follows :

(i) The pollutants may be converted to innocuous products before their release in the atmosphere. The industries should implement scientific methods to do the same. The most commonly used method of conversion of pollutant is by oxidation of air.

(ii) The use of crude fuels should be avoided to reduce SO_2.

(iii) Various practical technologies should be introduced for the reduction of burning fossil fuels.

6.5 NUCLEAR ACCIDENTS AND HOLOCAUST

In the year 1945 (6th Aug.), during the second world war America was responsible for Nuclear bomb-blast on Herosima and Nagasaki in Japan. It killed about 2 lakhs people. In the year 1951, Nuclear power was used for production of electricity in America. At present 17% of total power production depends upon nuclear power. But the nuclear accidents (Chernobyl, 1986) and Holocaust can destroy the whole world. Ionizing radiation due to these accidents create enormous problems for human beings and other animals.

Bad effects of ionizing radiation on human are—

1. Ionizing radiation has critical and dangerous ill-effects on human health. When the dosage of ionizing radiation rises above the danger level of 100 rads in factories or hospitals or nuclear plants, certain devastating accidents may result in a huge loss of lives and properties.

2. The dose of radiation which varies from 75-125 rads create symptoms like nausea, vomitting and general weakness. The formation of WBC and platelets formation decreases, the resistance power or immune system is supressed. The risk factors are growth of leukaemia and other forms of malignant tumours.

3. If a person is exposed to a high dose (200-1000 rads) of radiation the first symptom is vomiting, within 2-3 weeks the number of WBC and the platelets will decrease, bone-marrow will be depressed, no new blood cells will be formed, bleeding may occur from various parts of the body of the affected person.

4. If the dose of radiation is very high (more than 1000 rads) the nervous disorder symptoms like confusion, coma, severe cerebral oedema would appear and ultimately death occurs invariably within 36 hours to 48 hours.

5. Ionizing radiation is also responsible for affecting the skin, reproductive system causing impotency, sterility, and various defects in the foetus.

6. Various genetic defects may be carried in the next generation from an affected person exposed to a high dose of ionizing radiation.

6.6 WASTELAND RECLAMATION

A wasteland refers to a land which is not being used. This type of lands occur due to various constraints and they are at present lying unused. Example:- barren land, hilly slopes, overgrazed pastures, degraded forests, water-logged marshy lands, etc. The main causes of formation of wasteland are overgrazing, some side effects of development projects, unscientific land management and misuse. Wastelands may be classified into two groups :

1. **Culturable Wastelands :** Culturable wastelands means that they are cultivable and they may be used for agricultural purposes and can be afforested. Saline lands, gulled lands etc. are culturable wastelands.

2. **Unculturable Wastelands :** These are barren land, hilly slopes and they are not used for the purpose of cultivation. Steep sloping areas or snow-covered area, rocky lands, etc. are unculturable wastelands. Due to the disturbance of ecological balance unculturable wastelands are formed because wasteland formation and the ecosystem are directly or indirectly affected by this land. Culturable wastelands can be reclaimed by adopting the following remedial measures : (1) Planning for proper land use, (2) Developing awareness among the people about the potential toxicity of chemicals like pesticides, fertilizers etc. (3) Need of development of land protection policies. (4) Developing awarness about the hazards related to soil pollution and soil degradation.

Wastelands covers a large area in each country, there is a great demand for its useful se and use by several ways. The main objectives of wasteland are : conservation of ecological resources, improvement of the irrigation facilities, prevention of soil erosion, landslides and flooding.

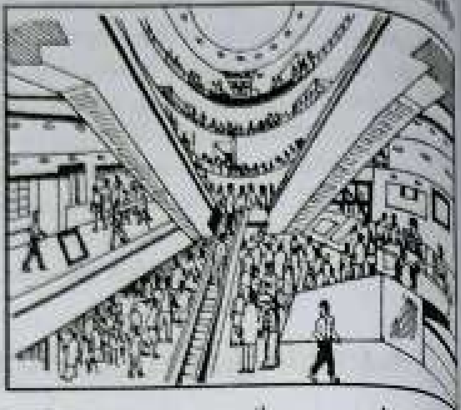
6.7 CONSUMERISM AND WASTE PRODUCTS

The consumer products are consumed by the people to satisfy their own requirement and to lead a more comfortable or easy life. Packaged food and other materials are easily available and people in turn make consumption a part of their life style, which is respons to create a solid waste problem for the future generation. There are some eco-frien products, which are easily identified by ecomark in respect to an eco-labelling scheme launched by the Government of India. The objectives of this eco-labelling schemes are :

1. The scheme should affect the consumer behaviour.

2. It should reduce the bad effects of their products on human behaviour.

3. Should indicate the environmental effect of the products.



Consumers collect the things that they buy and throw them after use. This use and throw policy produces an environmental problem. Different types of waste products like cartoons, bottles, cans, etc., are thrown each year i the developed countries. Green marketing has been neglected. Green marketing in an are is related to environmental protection. The high consumerism leads to the low incentive t the manufacture of long–lasting quality products and the cheaply-made products are import from the country of lowest-wage, to regulate overseas manufacture. Consumerism interfere with the workings of society by replacing the commonsense desire for sufficient supply o the necessities of life. There is unending quest for things and the money to buy variou products with little regard for the true utility or what to buy. In this way materialism is one of the end results of consumerism.

6.8 ENVIRONMENT PROTECTION ACT 1986

The Environment Protection Act, 1986 was fomuated to provide protection and prope improvement of environment. This act defines the various terms as follows :

1. 'Environmental pollution'—means the presence of any pollutant in the environmen
2. 'Environment pollutant'—substance or material which pollutes the environment.
3. 'Environment' consists of water, air and land and the-interirrelationship, which exis among air, land and water and human beings, other living organisms, plants, micro organisms and property or in between the is a me.
4. 'Hazardous substance' means any substance which is harmful to human beings plants, micro-organisms, our environment and property due to its chemicals or physico chemical hazards of handling.

The Environment Protection Act, 1986, has different types of objectives as follows :

1. Environment protection and improvement.
2. Establish a balance between human beings and their environment.

The Central Government has powers to save and improve environment. Everybody should follow the procedures, safeguards, restrictions and prohibition for the handling o hazardous substance. Materials and substances, which causes environmental pollution, must be examined in respect of the manufacturing processes. The Central Government, has suggested the following measures :

1. Establishment and recognization of environmental laboratories and Institutes.
2. Continuous observation on the standards for the environmental pollutants which are discharged from various sources.
3. Planning for environmental pollution problems to be carried out for research and investigations.
4. The Central Government may constitute an authority for the purpose of performing such functions and powers under section 4.3 of the Act.

SOME SECTIONS OF THE ACT :

(i) Section 7.1 suggests that any environmental pollutant in excess of prescribed standards to discharge any operation, industry or process is strictly prohibited. (ii) Section 8.2, suggests some procedural safeguards which are to be taken when any person handles hazardous substances.

Section 9.3, prescribed that each person is responsible for environmental pollution mitigation under the concerned authorities.

The section 10, suggested that the Central government officers have the power for failing or obstructing the process of protection of environment, which will be a punishable offence under this Act.

As per Section 11, the samples of air, water, soil or substance from the factories are collected by the Central Government for the purpose of analysis.

According to Section 12, the Central Government has the power to establish environmental laboratories. Under Section 16, the directors and principal officers of any company would fix the criminal liability in case of an offence being committed by a company.

The various provisions of the Environment (Protection) Act, 1986, have been amended for the effective implementation of this Act.

From the early 1970s our Central and State Governments have passed various laws in order to deal with environmental issues and problems. These laws are as follows :

(i) The Wildlife Protection Act, 1972.

(ii) The Water (Prevention and Control of Pollution) Act, 1974. This act was amended in 1978 and 1988.

(iii) The Forest (Conservation) Act 1980, was amended in 1988.

(iv) The Air (Prevention and Control of Pollution) Act, 1982 was amended. In 1988.

(v) The Environment (Protection) Act, 1986.

(vi) The National Environmental Tribunal Act, 1995.

A National Committee on Environmental Planning (NCEP) was set up during the Planning Period. The object is to promote research in respect to environmental problems and to establish facilities for such research-work wherever necessary.

The Central and State Water Boards are responsible for carrying out the legislative mandate contained in the Water Act. The most imortant administrative agency is the Department of Environment which has the powers and responsiblities to protect the environment. The functions of DOE are the development of environmental projects, administrative responsiblity for pollution monitoring and regulation, conservations of ecosystems, desginated as biosphere reserves and conservation of marine ecosystems.

The Central Government appointed a Committee under the Chairpersonship of M D. Tiwari on February 29, 1980, for recommending legislative measures for protecting environment. The Committee has formulated a draft national environmental policy resolution. The objectives of the national environment policy as laid down in the resolution are conserve and develop safe, healthy, productive and aesthetically satisfying environment upgrade and develop rural and urban settlements and enhance the quality of life promote environmental safety technologies and recycling of resources, to conserve bio diversity in the country by creating reserves and sanctuaries; to safeguard environment national marine zones; to evolve environmental norms and arrange for monitoring surveillance and collection and dissemination of information; to preserve scenic landscape to promote environmental education; to encourage research in environmental science and to develop adequate manpower within the country of ecologists, environmental scientists and planners."

The national environmental policies are as follows :

(1) To plan in a proper way to use and manage our enviornment for the benefit human being.

(2) To conserve biological, historical and cultural heritage of our nation.

(3) To support development activities to uplift the quality of the environment.

Some environmental policies which are adopted at national and state level are follows :

The Government of India Govt. adopted a few laws for the welfare of environment

(a) Environmental laws, water pollution control laws—1974.
(b) Water pollution prevention and control Act—1974.
(c) Air (Prevention and control of pollution) Act—1981.
(d) The Environment Protection Act—1986.
(e) The Motor Vehicles Act—1988.

Before Stockholm Symposium India Government adopted the following laws for the welfare of the environment.

(a) The Indian Fishers Act—1987.
(b) The Indian Port Act—1907.
(c) The Prevention of Food Adulteration Act—1954.
(d) The River Board Act—1956.
(e) Atomic Energy Act—1962.

West Bengal State government also adopted various laws. These are as follows :

(a) The West Bengal Municipal Act—1993.
(b) Calcutta Police Act—1866.
(c) Motor Vehicles Act—1988.

(d) The West Bengal Motor Vehicles Rules—1989
(e) Howrah Municipal Corporation Act—1980.
(f) The Hazardous Wastes (Management and Handling) Rules—1989.
(g) Drafted Rules of Regulating Biomedical Waste—1995.

6.9 AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

According to this Air Act, 1981 the definition of air pollution is—"Air pollution means the presence of any air pollutant such as solid, liquid or gaseous in the atmosphere in such concentration as may be injurious to human beings, plants or property." The Air Act, 1981, provides prevention and control of air pollution. For controlling of air pollution boards are established. An integrated approach has been taken for tackling the problems which are related to air-pollution. Any fuel which is likely to cause air pollution in any air pollution control area the State government has the power to declare the use of unlawful and to prohibit the use of it.

According to Section 21.3, any person who establishes or operates any industrial plant in an air pollution control area, should first consult the State Pollution Control Board. The Air Act has provisions for defining the powers, funds, penalties, procedures and functions of Pollution Control Board which ensures the emission standard from automobiles.

Section 24.5, prescribed that the State boards should provide power for testing and examining any control equipment, record, register, documents etc. of any industrial plant. The State Board is entrusted to the persons, who perform any of the above-stated functions.

Section 26, suggested to collect the samples of air on emission from any chimney, fuel or duct etc., and transfer the same for analysis to the laboratory which is established or recognized by the State Board. The penalties should be imposed or given for violations of the provisions under this Act. The main rule of this Act, is that before taking the defaulter to the court for the case to be filed in court, the defaulter should be given 60 days' notice. As the offender may destroy the evidence within 60 days so it becomes difficult to prove the offence. Another drawback is that no permission is necessary to be taken from the board for establishing an industry outside the air pollution control area. The Act is not applicable to any air-pollutant which is discharged into the atmosphere by a ship or aircraft.

6.10 WILD PROTECTION ACT—
THE WILDLIFE (PROTECTION) ACT, 1972

Wild Protection Act provides protection and conservation of wildlife and support to preserve and maintain the biodiversity, ecological processes and life supporting systems. There are two new types of reserves— conservation reserve and community reserve.

'Wildlife' means all types of animals, birds, plants, aquatic and land vegetation of any habitat or ecosystem.

'Hunting' means illegal action to capture, trap, kill and poison any wild animal.

'Habitat' means the place where any type of living being or vegetation live like land, water or vegetation which is the natural home of any wild animal. According to Section 3, the Central Government may appoint a Director of Wildlife Preservation but under Section 4, the State Government may appoint a Chief Wildlife Warden or Wildlife Warden. The State Government may create national parks and sanctuaries for protecting the habitat of plants and animals and landscape, seascape etc. The main purpose of conservation and community reserves are improving the socio-economic conditions of the people living in protected areas as well as conservation of Wildlife. Under Wild Protection Act several types of conservation projects for individual endangered species like Tiger, Lion, Crocodile got started. The members of a Wildlife Advisory Board are the Forest Officer-In-charge of the State Forest Department, Chief Wildlife Warden, two members of the State legislature, etc. Hunting is strictly prohibited by any person under Section 9. But Section 11 and 12 provided hunting in certain exceptional cases as :

1. When any wild animal has become dangerous to human life or any wild animal which has suffered from a disease which is beyond recovery. In this case if the Chief Wildlife Warden is satisfied he gives order in writing stating the reason for hunting the animals and permits any person to hunt such animal.

2. If any wild animal is killed or wounded in good faith or any wild animal is killed in self-defence it shall not be an offence.

Under section 12, the Chief Wildlife Warden may grant a permission to any person or Institution or organisation for hunting any wild animal in respect of certain specified purposes like scientific research and management, education and collection of specimens, etc.

The Chief Wildlife Warden or Authorized Officer may cancel any licence granted under section 44 after collecting the reasons in writing and after giving the licence-holder reasonable opportunity to be heard. A person shall be punished with imprisonment for three years or a fine of Rs. 23000/- if he violates any provision of this Act and he shall be decend guilty of offence under this Act.

6.11 WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974

This act provides prevention and control of water pollution. Water pollution is defined as the alternation of the physical, chemical & biological properties of water which is harmful and injurious to human health and safety. Other animal and plants are also affected by this change.

The C.P.C.B. (Central Pollution Control Board) has the following members—

(1) Member-secretary. (2) Two persons who are nominated by the Govt. to represent the companies. (3) A full-time chairman having practical experience of environmental protection. (4) The Central Government nominated five officials of Central Pollution Control Board for prevention and control of pollution. Training programmes were organized to prepare manuals for disposal and treatment of sewage and effluents.

The State Pollution Control Boards are governed by the directions of Central Pollution Control Board. The CPCB advises the State government with respect to the location of any industry that might pollute a river or pond or lake. Central or State Government have power for removing a member of the Central or State Board at any time by giving him any official notice. A member may submit his resignation to the chairman and the chairman may resign by addressing his resignation to the government. One meeting must be held in every three months according to Section 8. Central Board has been performing the following functions :

1. Analysis of water samples to establish or recognise laboratories.
2. Organising training of persons and comprehensive programme for population control.
3. Implementation of schemes in different areas of the state to promote cleanliness of wells and streams.
4. For treatment and disposal of sewage and trade effluents to prepare manuals or guides.

If a person causes pollution by way of disposal of polluting matter into a stream or on lands, the Board may approach the court for restraining the person. When domestic waste gets discharged into water it leads to contamination and causes some water-borne diseases like—cholera, dyssentry, typhoid etc. Highest priority should be given to the Act for prevention of pollution of drinking water-source. So there should be prohibition of discharges of both treated and untreated substances or chamicals, into water bodies which are used for drinking and bathing purposes.

6.12 FOREST CONSERVATION ACT, 1980

Forest Conservation Act, 1980 is very important because we know that forest is a vital natural resource and it gives wide-spread products, which are useful for our life. So protection and conservation of forest is a necessary fact, which ensure judicious use of forest products.

"Forest" means a land or a community composed predominantly of shrubs, trees and woody climbers.

"Forest-Offence" is a well-known term that means an offence which is punishable according to this Act.

"Forest-Officer" means a person, appointed by State Govt., who carries out the duties and objectives under this Act.

Forest Conservation Act was recognised by parliament in the thirty first year after the Republic of India came into force on the 25th October, 1980. The State Government may declare that any tree in a protected forest is reserved under Section 30 and the cutting up and clearing of the tree for cultivation, for buildings or hearding cattle is strictly prohibited. According to this Act any person who commits any type of offence, the penalty in terms of imprisonment of six months or more, five hundred rupees or more as a fine from him or both will be imposed. According to the Act :

1. If any reserved tree in any protected forest is damaged by cattle the act should be deemed as an offence.

2. Imprisonment of six months or a fine of five thousand rupees or both would be imposed if a person kills or catches elephants in any forest.

3. Destroying or Clearing of a forest for cultivation, quarrying any stone, burning lime or charcoal or collecting or removing any forest products are strictly prohibited.

The state government made rules for regulating the management and duties for protection and improvement of village forests and the rules are published by notification in the official gazette.

An authority or any organisation requires to take the following mesures as necessities

1. To get aware or know about the Environmental pollution and its hazard to study, plan and implement long-term requirement of environmental safety.

2. To review the legislation of the forest Act.

3. To co-ordinate with the activities regarding environmental safety and preservation of forest of other agencies.

6.13 ISSUES INVOLVED IN ENFORCEMENT OF ENVIRONMENTAL LEGISLATIONS

Environmental Acts or the Environmental laws are necessary for protecting and improving our environmental quality. Different types of Boards were set up in various sectors by the Central Government for the Prevention and Control of Water Pollution, and air pollution. These Acts were adopted by the State legislatures. The Environment (Protection) Act, 1986 is called as the umbrella of legislation. The "Environment Protection and Improvement" is a responsibility of Central Government. In fact there are some drawbacks in environmental legislations and problems in respect of their effective implementation. The Act empowered the authorities for specific fields which include the following :

1. Coastal Zone Authority.
2. Environment Pollution Authority.
3. Loss of Ecology Authority, Tamil Nadu.
4. Taj Trapezium Zone Pollution Authority.

The pollution Acts have been demerits which are given below :

1. The environmental damage caused by the big industries due to pollution is very significant in comparision to the provision of penalties in the Act.

2. The sound policy pronouncements are not backed by the pollution control Acts.

The pollution control boards are empowered to impose fines on any person or organisation depending on the nature and extent of the pollution which is caused. The Pollution Control Boards are set up for this purpose. The Pollution Control Board of both State and Central have the responsibilities for enforcement of various environmental regulations in addition to the Acts relating to water and air pollution control. Activities of pollution control Board play a vital role with the help of investigation, suggestions, for remedial measures and monitoring their implementation. For effective functioning of the pollution control machinery professional man-power and laboratory infrastructure for pollution monitoring are required.

6.14 Biological Diversity Act, 2002

The **Biological Diversity Act, 2002** is an Act of the Parliament of India for preservation of biological diversity in India, and provides mechanism for equitable sharing of benefits arising out of the use of traditional biological resources and knowledge. The Act was enacted to meet the obligations under Convention on Biological Diversity (CBD), to which India is a party.

Biodiversity and biological resource

Biodiversity has been defined under Section 2(b) of the Act as "the variability among living organisms from all sources and the ecological complexes of which they are part, and includes diversity within species or between species and of eco-systems". The Act also defines. Biological resources as "plants, animals and micro-organismsor parts thereof, their genetic material and by-products (excluding value added products) with actual or potential use or value, but does not include human genetic material."

National Biodiversity Authority and State Biodiversity Boards

The National Biodiversity Authority (NBA) is a statutory autonomous body, headquartered in Chennai, under the Ministry of Environment and Forests, Government of India established in 2003 to implement the provisions under the Act. State Biodiversity Boards (SBB) has been created in 28 States along with 31,574 Biological management committees (for each local body) across India.

Functions

- Regulation of acts prohibited under the Act
- Advise the Government on conservation of biodiversity
- Advise the Government on selection of biological heritage sites
- Take appropriate steps to oppose grant of intellectual property rights in foreign countries, arising from the use of biological resources or associated traditional knowledge.

Regulations

A foreigner, non-resident Indian as defined in clause (30) of section 2 of The Income-tax Act, 1961 or a foreign company or body corporate need to take permission from the NBA before obtaining any biological resources or associated knowledge from India for research, survey, commercial utilisation. Indian citizens or body corporates need to take permission from the concerned State Biodiversity Board.

Result of research using biological resources from India cannot be transferred to a non-citizen or a foreign company without the permission of NBA. However, no such permission is needed for publication of the research in a journal or seminar, or in case of a collaborative research made by institutions approved by Central Government.

No person should apply for patent or other form of intellectual property protection based on the research arising out of biological resources without the permission of the NBA. The NBA while granting such permission may make an order for benefit sharing or royalty based on utilisation of such protection.

Benefit sharing

Benefit sharing out of usage of biological resources can be done in following manner:
- Joint ownership of intellectual property rights
- transfer of technology
- location of production, research development units in the area of source
- payment of monetary and non-monetary compensation
- setting up of venture capital fund for aiding the cause of benefit claimers

Penalties

If a person, violates the regulatory provisions he will be "punishable with imprisonment for a term which may extend to five years, or with fine which may extend to ten lakh rupees and where the damage caused exceeds ten lakh rupees such fine may commensurate with the damage caused, or with both."

Any offence under this Act is non-bailable and cognizable.

6.15 International Agreets

6.15.1 Montreal Protocol :

The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. It was agreed on 26 August 1987, and entered into force on 26 January 1989, followed by a first meeting in Helsinki, May 1989. Since then, it has undergone eight revisions, in 1990 (London), 1991 (Nairobi), 1992 (Copenhagen), 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal), 1998 (Australia), 1999 (Beijing) and 2016 (Kigali, adopted, but not in force). As a result of the international agreement, the ozone hole in Antarctica is slowly recovering. Climate projections indicate that the ozone layer will return to 1980 levels between 2050 and 2070. Due to its widespread adoption and implementation it has been hailed as an example of exceptional international co-operation, with Kofi Annan quoted as saying that "perhaps the single most successful international agreement to date has been the Montreal Protocol." In comparison, effective burden sharing

and solution proposals mitigating regional conflicts of interest have been among the success factors for the ozone depletion challenge, where global regulation based on the Kyoto Protocol has failed to do so. In this case of the ozone depletion challenge, there was global regulation already being installed before a scientific consensus was established. Also, overall public opinion was convinced of possible imminent risks.

The two ozone treaties have been ratified by 197 parties, which includes 196 states and the European Union, making them the first universally ratified treaties in United Nations history.

These truly universal treaties have also been remarkable in the expedience of the policy-making process at the global scale, where only 14 years lapsed between a basic scientific research discovery (1973) and the international agreement signed (1985 & 1987). 197 Nations decided to reduce the Production of CFC responsible for ozone depletion and they replace CFC by HCFC or, CFHC.

Measures to Control Greenhouse Effect or Global Warming :

The greenhouse effect can be controlled by adopting following measures to reduce CO_2 concentration in the atmosphere:

1. By reducing the use of fossil fuels.
2. By using unleaded petrol and catalytic converters in the cars.
3. By using antipollution devices in buses and industrial plants.
4. Reforestation at a large scale to increase forest cover and, thereby decreases greenhouse effect. Trees are described as big natural sink of CO_2. Therefore, plantation of trees at large scale is the most essential step.
5. Developing alternative renewable sources of energy such as compressed natural gas (CNG), ethanol, reformulated gasoline, gasohol (gasoline blended with 20% ethanol or methanol) and methanol can be used as a substitute to petrol. Hydrogen or liquid hydrogen can also be used as a substitute to petrol. Use of eco-friendly fuel or biodiesel is another method of reducing atmospheric pollutants.

6.15.2 KYOTO PROTOCOL

Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC or FCC). It was aimed at fighting global warming by reducing and stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic effect on world's climate.

History of Kyoto Protocol : Kyoto Protocol was adopted on llth December, 1997 when about 6000 UN delegates from more than 160 countries met in Kyoto, Japan to negotiate a treaty against possible threat of global warming on climate change and reduce greenhouse gas emissions by 8 per cent. The protocol was enforced on 16th February, 2005. As of July 2010, 191 states have signed and ratified the protocol.

Salient Features of Kyoto Protocol : Under Kyoto Protocol, its members committed themselves to a reduction of four greenhouse gases (GHG). These gases include carbon dioxide, methane, nitrous oxide and sulphur hexafluoride and two groups of gases, hydrofluorocarbons and perfluorocarbons. The benchmark of 1990 emission levels were accepted and rich industrial countries agreed to reduce their GHG emissions by 5.2 per cent by 2010. Developing countries were not set formal emission limits because this limitation will hamper or inhibit their economic growth. Though most industrialised countries have promised to abide by Kyoto Protocol, the United States rejected the Kyoto Accord and insisted that developing countries should accept the emission targets before it is willing to reduce its own generation of GHGs. According to USA and Russia, Kyoto Accord is too damaging to industry.

Some of the principal concepts of the Kyoto Protocol are :

- Binding commitments for the Annex I Parties. The main feature of the Protocol is that it established legally binding commitments to reduce emissions of greenhouse gases for Annex I Parties. The commitments were based on the Berlin Mandate, which was a part of UNFCCC negotiations leading up to the Protocol.
- **Implementation**— In order to meet the objectives of the Protocol, Annex I Parties are required to prepare policies and measures for the reduction of greenhouse gases in their respective countries. In addition, they are required to increase the absorption of these gases and utilize all mechanisms available, such as joint implementation, the clean development mechanism and emissions trading, in order to be rewarded with credits that would allow more greenhouse gas emissions at home.
- Minimizing Impacts on Developing Countries by establishing an adaptation fund for climate change.
- Accounting, Reporting and Review in order to ensure the integrity of the Protocol.
- **Compliance**— Establishing a Compliance Committee to enforce compliance with the commitments under the Protocol.

Kyoto : Success or Failure?

Kyoto Protocol, though well intentioned has failed to produce any reductions in emission greenhouse gases in last fifteen or twenty years because CO_2 levels in the atmosphere are at a frightening rate and global temperatures are continuously rising.

Kyoto Protocol is seen as an important first step towards global emission reduction stabilise GHG emissions. It provides the essential architecture for future international agreement on climate change.

By the end of first commitment period of Kyoto Protocol in 2012, a new interna framework needs to be negotiated and ratified that can deliver stringent emission reduced. The Intergovernmental Panel on Climate Change (PCC) has clearly indicated its need.

6.16 CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, is a multilateral treaty. The Convention has three main goals including: the conservation of biological diversity (or biodiversity); the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources.

In other words, its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development. The Convention was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993. At the 2010 10th Conference of Parties (COP) to the Convention on Biological Diversity in October in Nagoya, Japan, the Nagoya Protocol was adopted.

Some of the many issues dealt with under the convention include :

- Measures the incentives for the conservation and sustainable use of biological diversity.
- Regulated access to genetic resources and traditional knowledge, including Prior Informed Consent of the party providing resources.
- Sharing, in a fair and equitable way, the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources (governments and/or local communities that provided the traditional knowledge or biodiversity resources utilized).
- Access to and transfer of technology, including biotechnology, to the governments and/or local communities that provided traditional knowledge and/or biodiversity resources.
- Technical and scientific cooperation.
- Coordination of a global directory of taxonomic expertise (Global Taxonomy Initiative).
- Impact assessment.
- Education and public awareness.
- Provision of financial resources.
- National reporting on efforts to implement treaty commitments.

6.17 PROTECTED AREAS

They are ecological/biogeographical areas where biological diversity alongwith natural and resources are protected, maintained and managed through legal or other effective measures. The delimited on the basis of biological diversity, e.g., cold desert (Ladakh and Spiti), hot desert wetland (Assam and N.E. States), saline swampy areas (Sunderbans, Rann of Kutch), many temperate forests, subtropical forests, tropical wet evergreen forests, tropical moist deciduous and tropical dry deciduous forests, tropical thorn, coral reefs, etc. Protected areas include national sanctuaries and biosphere reserves. World Conservation Monitoring Centre has recognised protected areas world-wide. In September 2002, India has 581 protected areas of national parks, wildlife sancturaies covering 4-7% land surface against 10% internationally. The various benefit protected areas are (i) Maintaining genetic diversity of all the present species and varieties. (ii) Maintaining viable populations of native species, subspecies and varieties. (iii) Maintaining resilience in species/habitats/ecosystems to adapt to environmental changes. (iv) Maintaining various types of communities/ecosystems/habitats both in number and distribution. (v) Change human aided introduction of alien exotic species.

National Parks

They are areas maintained by government and reserved for betterment of wildlife. Cultivating, grazing, forestry and habitat manipulation are not allowed. There are 92 (India 2005) national park (66 in 1988) in India, occupying nearly 1·1% of geographical area. The first national park of India is Jim Corbett National Park (1936). Some early national parks of world are Yellowstone Park (USA), Royal Park (near Sydney, Australia).

Sanctuaries

They are tracts of land with or without lake where wild animals/fauna can take refuge without hunted. Other activities like collection of forest products, harvesting of timber, private owners land, tilling of land, etc. are allowed. India has 500 (India 2005, 368 in 1988) sanctuaries occupying 3·6% of geographical area.

Biosphere Reserves

They are multipurpose protected areas which are meant for preserving genetic diversity representative ecosystems of various natural biomes and unique biological communities by protecting wild populations, traditional life style of tribals and domesticated plant/animal genetic research. Creation of biosphere reserve was initiated in 1975 under MAB programme of UNESCO. The year 2002, 408 biosphere reserves had been established in 94 countries. In India, 14 potential sites identified in 1979 by Core Advisory Group but the number was increased later on. 13 biosphere reserves have been set up by now. They are also notified as national parks. Each biosphere reserve a

(i) **Core or Natural Zone.** No human activity is allowed. The area is undisturbed and legally ecosystem protected.

(ii) **Buffer Zone.** It surrounds the core area. It is managed to accommodate vary of resource use strategies, research and education.

(iii) **Transition Zone** (Manipulation Zone). It is outermost or peripheral part of biosphere reserve where an active cooperation is present beside reserve management and local people for activities like settlements, cropping, recreation, forest, other economic uses without disturbing ecology. Transition zone has different parts like forest agricultutre, tourism and restoration regions. **Restoration region** is degraded area which is selected restoration to near natural form.

Importance.

(i) **Restoration.** Biosphere reserves help in restoration of degraded ecosystems and habitats.

(ii) **Conservation.** They are a means of conserving genetic resources, species, ecosystems, landscapes without uprooting the local people.

Protected areas or conservation areas are locations which receive protection because of their recognized natural, ecological or cultural values. There are several kinds of protected areas, which vary by level of protection depending on the enabling laws of each country or the regulations of the international organizations involved.

The term "protected area" also includes Marine Protected Areas, the boundaries of which will include some area of ocean, and Transboundary Protected Areas that overlap multiple countries which remove the borders inside the area for conservation and economic purposes. There are over 161,000 protected areas in the world (as of October, 2010) with more added daily, representing between 10 and 15 per cent of the world's land surface area. By contrast, only 1.17% of the world's oceans is included in the world's – 6,800 Marine Protected Areas.

Protected areas are essential for biodiversity conservation, often providing habitat and protection from hunting for threatened and endangered species. Protection helps maintain ecological processes that cannot survive in most intensely managed landscapes and seascapes.

Protection of natural resources objective of protected area :

The objective of protected areas is to conserve biodiversity and to provide a way for measuring the progress of such conservation. Protected areas will usually encompass several other zones that have been deemed important for particular conservation uses, such as Important Bird Areas (IBA) and Endemic Bird Areas (EBA), Centres of Plant Diversity (CPD), Indigenous and Community Conserved Areas (ICCA), Alliance for Zero Extinction Sites (AZE) and Key Biodiversity Areas (KBA) among others. Likewise, a protected area or an entire network of protected areas may lie within a larger geographic zone that is recognised as a terrestrial or marine ecoregions (see, Global 200), or a crisis ecoregions for example. As a result, Protected Areas can encompass a broad range of governance types. Indeed, governance of protected areas has emerged a critical factor in their success.

Subsequently, the range of natural resources that any one protected area may guard is vast. Many will be allocated primarily for species conservation whether it be flora or fauna or the relationship between them, but protected areas are similarly important for conserving sites of (indigenous) cultural importance and considerable reserves of natural resources such as;

- **Carbon Stocks :** Carbon emissions from deforestation account for an estimated 20% of global carbon emissions, so in protecting the worlds carbon stocks greenhouse gas emissions are reduced and longterm land cover change is prevented, which is an effective strategy in the struggle against global warming. Of all global terrestrial carbon stock, 15.2% is contained within protected areas. Protected areas in South America hold 27% of the world's carbon stock, which is the highest percentage of any country in, both absolute terms and as a proportion of the total stock.

- **Rainforests** : 18.8% of the world's forest is covered by protected areas and sixteen of the twenty forest types have 10% or more protected area coverage. Of the 670 ecoregions with forest cover, 54% have 10% or more of their forest cover protected under IUCN Categories I-VI.
- **Mountains** : Nationally designated protected areas cover 14.3% of the world's mountain areas, and these mountainous protected areas made up 32.5% of the world's total terrestrial protected area coverage in 2009. Mountain protected area coverage has increased globally by 21% since 1990 and out of the 198 countries with mountain areas, 43.9% still have less than 10% of their mountain areas protected.

Annual updates on each of these analyses are made in order to make comparisons to the Millennium Development Goals and several other fields of analysis are expected to be introduced in the monitoring of protected areas management effectiveness, such as freshwater and marine or coastal studies which are currently underway, and islands and drylands which are currently in planning.

6.18 TRIBAL POPULATION AND RIGHTS

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, is a key piece of forest legislation passed in India on 18 December 2006. It has also been called the Forest Rights Act, the Tribal Rights Act, the Tribal Bill, and the Tribal Land Act. The law concerns the rights of forest-dwelling communities to land and other resources, denied to them over decades as a result of the continuance of colonial forest laws in India.

Supporters of the Act claim that it will redress the "historical injustice" committed against forest dwellers, while including provisions for making conservation more effective and more transparent. The demand for the law has seen massive national demonstrations involving hundreds of thousands of people.

However, the law has also been the subject of considerable controversy in the English press in India. Opponents of the law claim it will lead to massive forest destruction and should be repealed (see below).

A little over one year after it was passed, the Act was notified into force on 31 December 2007. On 1 January 2008, this was followed by the notification of the Rules framed by the Ministry of Tribal Affairs to supplement the procedural aspects of the Act.

Population : According to 2011 census Tribal people constitute 8·6% of the nation's total population, over 104 million people. Adivasi (Tribal) societies are particularly prominent in A.P., Chattisgarh, Gujrat, M.P., Jharkhand, Maharastra, Odhisa, W.B. and some north-east states 75% of the tribal population live in central Indian states.

Types of rights

The rights which are included in section 3(1) of the Act are :

1. Right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation.

2. Community rights such as nistar, by whatever name called, including those used in erstwhile Princely states, Zamindari or such intermediary regimes.
3. Right of ownership, access to collect, use, and dispose of minor forest product.
4. Rights of uses of entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resources.
5. Rights including community tenures of habitat and habitation for primitive tribal groups and pre-agriculture communities.
6. Rights in or over disputed lands under any nomenclature in any State where claims are disputed.
7. Rights for conversion of Pattas or leases or grants issued by any local council or any State Govt. on forest lands to titles.
8. Right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.
9. Right of access to biodiversity and community right to intellectual property and traditional knowledge related to diversity and cultural diversity.

Educational and Cultural Safeguard :

Article 15(4) : Special provisions for Advancement.
29 : Protection of interests.
46 : The state shall promote with special care the educational and economic interests of S.T. and project from social injustice.
350 : Right to conserve distinct language, Script or culture, Instruction in Mother tongue.

Social Safeguard :

Art 23 : Prohibition of forced labour, beggar and traffic in human beings.
24 : Forbidding child labour.

Economic Safeguard :

Article 275 : Grants-in-aid to specified states.
244 (1) : Administration of ST areas under 5th & 6th Schedule.

Political Safeguard :

Article 330, 337, 243 : Reservation of Seats in Loksava, State Legislative, Panchayat.
324 : 10 yrs., period or reservation.

Safeguard under other laws :

(i) Bonded Labour System (Abolition) Act 1976
(ii) Child Labour Prohibition Act 1986
(iii) Panchyat Act 1996

(iv) Minimum wages Act 1948
(v) Forest Right Act 2006

6.19 HUMAN-WILDLIFE CONFLICT

Human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Conflict management strategies earlier comprised lethal control, translocation, regulation of population size and preservation of endangered species. Recent management approaches attempt to use scientific research for better management outcomes, such as behaviour modification and reducing interaction. As human-wildlife conflicts inflict direct, indirect and opportunity costs, the mitigation of human-wildlife conflict is an important issue in the management of biodiversity and protected areas.

Nature of human-wildlife conflicts

Causes

As human populations expand into wild animal habitats, natural wildlife territory is displaced. Reduction in the availability of natural prey/food sources leads to wild animals seeking alternate sources. Alternately, new resources created by humans draw wildlife resulting in conflict. The population density of wildlife and humans increase with overlaps in geographical areas used increasing their interaction thus resulting in increased physical conflict. Byproducts of human existence offer un-natural opportunity for wildlife in the form of food and sheltered interference and potentially destructive threat for both man and animals. Competition for food resources also occurs when humans attempt to harvest natural resources such as fish and grassland pasture. Another cause of conflict comes from conservation biased toward flagship or game species that often threatens other species of concern.

Case Studies.

The main objectives of Resettlement and Rehabilitation policy being implemented by the govt. of India are as under :

1. Be fully integrated in the community in which the affected families are resettled.
2. Improve the standard of living of the displaced people or at least regain the standard of living of the PAF (Project-Affected Families) who have been staying there prior to their displacement.
3. Adequate participation by the PAFS in their community should be ensured. The project-wise progress in the area of resettlement and rehabilitation of project-affected families of some of the on-going projects in India should be monitored.

Case Study

(i) **Chipko Movement :** The Chipko Movement is the most well-known people's movement for environmental protection in India. It is a movement of those people who are living in and around the forests that sustain their lives.

The destruction of forests for the survival of the local people through commercial forestry created the Chipko Movement first in the Himalayan area of U.P. Then the movement gradually got spread to other mountain areas such as the Western Ghats, the Aravallis and the Vindhyas.

Villagers have created an effective non-violent way to stop the devastation by forest industries. When the axe–men comes, the people mainly the women form circles around the trees—they embrace the trees. This had given the movement its name, 'the tree-hugging movement, or Chipko Andolan.

The movement was initiated for the protection of forests in India at the end of the year 1960. The main objective of the movement, however, was to ensure survival of the tribal people. Notable among these movements are those of the people of the Singhbhum and the Baster regions. Later on Sundarlal Bahuguna joined this movement. These movements have sought to convert, mixed natural forests into monoculture of commercial species like teak or tropical pine. It is resorted to because this process of conversion leads to the destruction of the material base for survival of a large proportion of tribal people. The. movement was so intensified that the P.M. of India declared that a single tree would not be touched for the next 15 years.

(ii) **Silent Valley Movement :** Silent Valley, a densely-forested valley is situated in Palghat district off north Kerala. The name is given as "Silent Valley" as the forest is very deep, dark and peaceful. The river Kunithpara which is not navigable, is flowing across this valley from North to South.

The State Government planned to construct a dam along the slopes of the river. A British technical expert opined that, hydro–electricity could be easily generated from this flowing stream and the planning commission approved the proposal.

Later on, in 1976, a task force headed by the vice president of W.W.F.Y (World Wild Life Fund) in their report advised not to implement the project. They advised that, if the project was implemented then, it would cause ecological disbalance in that region.

The popular science organization of Kerala (Kerala Shastriya Sahitya Parishad, KSSP), started movement to stop the project. They went for mass signature campaign. The resolution of the project was accepted in the assembly. KSSP wrote a booklet and vehimently opposed this project. They forced the government to postpone the project. Morarji Desai, who was the Prime minister of India then also supported the project along with State Government. But many environmentalists like to Salim Ali, IUCN rallied against the implementation of the project.

In December, 1980, the Kerala Government announced to reject the project. The Silent Valley was declared as National Park.

(iii) Narmada Bachao Andolan : Narmada is a very important river in India, it originates from Amarkantak and ends in Arabian Sea. In Narmada valley, the ancient civilization and culture was grown up by the oldest races like, Bhils and Gondas of Indian civilization. Two largest dam reservoirs, **'Sardar Sarovar'** and **'Narmada Sagar'** were planned to be constructed over the river Narmada in Gujrat and M.P. respectively. The objectives of this project were—(i) to generate 1450 M.W. electricity, (ii) to provide irrigation facilities for at least three states in India. (iii) to check flood and subsequently save the people from loss due to floods.

Baba Amte first protested against Narmada dams. He wanted to make this project a public issue. Later on, an environmentalist called Medha Patkar, inspected the villages which would be affected by this project and noticed some inherent flaws.

(i) The total cost to materialise the project was very high which would not bring any profit,

(ii) More than one million villagers would be badly affected,

(iii) The plants and animals resources would be lost which in turn, would hamper the ecological balance. Many organisations started a mass movement under the leadership of Medha Patkar. This movement was known as Narmada Bachao Andolon (NBA). In September 1989, more than 50,000 people gathered in Harsud valley and protested to ban the project. The activities raised a few issues—

(i) According to NBA the total amount of electricity would not exceed 50 M.W. though it was estimated to generate 1450 M.W. of electricity.

(ii) According to NBA, the flood would be checked in one area but it would cause flood in another area and it would not contribute anything to the irrigation facility.

(iv) The total cost was estimated around Rs. 20,000 crore but NBA estimated that local lost would exceed Rs. 40,000 crore.

(v) More than One million people would become homeless and would lose their agricultural lands and according to NBA, the rehabilitation and compensation due to the loss of properties would not be considered by India Government.

(iv) Tehri Garhwal : The Tehri Dam and the Hydro-Electric Project is situated on the mountainous regions of Uttar Pradesh on the river Ganga. The main bone of contention was that about one lakh people would become homeless and the ecology of the area would be disturbed owing to the construction of the dam. It turned out to be a tremendous mass movement which was led by Sundarlal Bahuguna—who undertook several fasting (anashana). Finally the project was dropped in 1990.

M.C.Q.

1. **Which of the following is a non—biodegradable pollutant—**
(a) Organic Waste (b) Electronic Waste (c) Night soil.

2. **Which one is not a renewable energy source—**
(a) Geothermal energy (b) Solar energy (c) Fossil Fuel.

3. **Cauvery Water dispute is between—**
(a) Tamil Nadu and Andhra Pradesh (b) Karnataka and Tamil Nadu
(c) Kerala and Tamil Nadu.

4. **Conference related to control of ozone depleting substances is**
(a) Montreal Protocol (b) Stockholm Conference (c) Toronto World Conference.

5. **The skin cancer is caused by—**
(a) The Green House Effect (b) UV Exposures (c) None of these.

6. **The allowed thickness of plastic carry bags in the shops is–**
(a) 20 microns (b) 30 microns (c) 40 microns

7. **Nitrogen-fixing bacteria are—**
(a) Rhizobium (b) Bacillus (c) Dersia.

8. **Any nuclear reactor generally utilizes—**
(a) U^{234} (b) U^{235} (c) U^{236}

9. **The first detection of ozone hole occurred in—**
(a) Pensylvania (b) Caroline Islands (c) Antarctica.

10. **Collectively Sundarban is a—**
(a) Sanctuary (b) Biosphere reserve (c) Protected forest.

11. **The Water Pollution Prevention and Control Act was introduced in—**
(a) 1964 (b) 1974 (c) 1984

12. **The Environment Protection Act was introduced in the year—**
(a) 1985 (b) 1986 (c) 1984 (d) 1990

13. **The Air Pollution Control Act was introduced in—**
(a) 1981 (b) 1983 (c) 1984 (d) 1985

14. **Wildlife Protection Act was introduced in—**
(a) 1972 (b) 1978 (c) 1988 (d) 1992

15. **Forest Conservation Act was introduced in—**
(a) 1986 (b) 1980 (c) 1982 (d) 1989

16. **The Indian Fishers Act was introduced in—**
(a) 1985 (b) 1986 (c) 1987 (d) 1988

17. **The West Bengal Municipal Act was introduced in—**
(a) 1990 (b) 1992 (c) 1993 (d) 1994

18. **Motor Vehicles Act was introduced in—**
(a) 1986 (b) 1988 (c) 1989 (d) 1985

19. The Atomic Energy Act was introduced in—
(a) 1962 (b) 1956 (c) 1959 (d) 1965

20. Average P^H value in acid rain is—
(a) 9.5 (b) 5.6 (c) 8.5 (d) 6.5

21. The average temparature of the earth is—
(a) 18°C (b) 15°C (c) 20°C (d) 12°C

22. Green house effect is related to—
(a) Increased growth of green algae (b) Global warming
(c) Cultivation of vegetables in houses (d) Development of terrace gardens.

23. Green house gases include
(a) CO_2, CFC, CH_4 and NO_2 (b) CO_2, O_2, N_2, NO_2 and NH_3
(c) CH_4, N_2, CO_2 and NH_3 (d) CFC, CO_2, NH_3 and N_2.

24. Which is not a green house gas
(a) Chlorofluorocarbon (b) Methane (c) Carbon dioxide (d) Hydrogen.

25. Concentration of green house gases is increasing due to
(a) Deforestation (b) Increased use of refrigerators
(c) Increased combustion of coal and petroleum (d) All the above.

26. Which gas contributes most to green house effect
(a) CFC (b) Freon (c) CO_2 (d) CH_4.

27. Which gas of the atmosphere holds up ultraviolet rays
(a) O_2 (b) O_3 (c) N_2 (d) CO_2.

28. Checking of re-radiating heat by atmospheric dust, O_3, CO_2 and water vapours is—
(a) Ozone layer effect (b) Solar effect
(c) Radioactive effect (d) Green house effect.

29. Liberation of H_2S/foul smell in tanks, ponds, etc. is due to—
(a) Anaerobiosis (b) Aerobiosis (c) Psammophytes
(d) Biological magnification

30. Ultra-violet radiations from sunlight cause reaction which produces
(a) O_3 (b) SO_2 (c) CO (d) CH_4.

31. Which green-house gas other than methane is being produced by agricultural fields
(a) Nitrous oxide (b) Ammonia (c) Sulphur dioxide (d) Arsenic.

32. Green house effect is mostly due to
(a) CO_2 (b) CO (c) NO_2 (d) H_2O.

33. Green house effect is due to
(a) CO_2 (b) CH_4, SO_2 and NO_2 (c) Combination of many gases
(d) Gases which absorb infra-red rays reflected from earth.

34. Green house effect is increasing due to
(a) Increasing CO_2 concentration (b) Increasing SO_2 concentration
(c) Increasing concentration of chlorofluorocarbons
(d) Hole in ozone layer.

35. Peak concentration of ozone occurs in the atmosphere above a height of
(a) 10 km (b) 15 km (c) 20 km (d) 30 km.

36. Green house effect is due to accumulation of
(a) O_3 and depletion of CO_2 (b) O_3 and CO_2
(c) CO_2 and depletion of O_3 (d) Green plants.

37. A green house gas is
(a) H_2 (b) CO (c) CO_2 (d) N_2

38. The reason for green-house effect is
(a) Higher CO_2 concentration causing global warming
(b) Absorption of infra-red rays by gases and dust particles
(c) Both a and b (d) Rarefaction of CO_2

39. Disease caused by eating fish found in water contaminated with industrial waste having mercury is
(a) Minamata disease (b) Bright's disease
(c) Hashimoto's disease (d) Osteosclerosis.

40. Drawback of DDT as pesticide is
(a) It becomes ineffective after some time (b) It is less effective than others
(c) It is not easily/rapidly degraded in nature
(d) Its high cost.

41. Sound becomes hazardous noise pollution at level
(a) Above 30 dB (b) Above 80 dB (c) Above 100 dB (d) Above 120 dB.

42. Fish die in water bodies polluted by sewage due to
(a) Pathogens (b) Clogging of gills by silt
(c) Reduction in oxygen (d) Foul smell.

43. Lichens indicate pollution by
(a) O_3 (b) SO_2 (c) NO_2 (d) CO.

44. Drained sewage has B.O.D.
(a) More than that of water (b) Less than that of water
(c) Equal to that of water (d) None of the above.

45. B.O.D. is connected with
(a) Organic matter (b) Microbes
(c) Microbes and organic matter (d) None of the above.

46. UV radiations bring about
(a) Skin cancer (b) Mouth cancer (c) Lungs cancer (d) Liver cancer.

47. Taj Mahal is threatened by pollution from
(a) Chlorine (b) Sulphur dioxide (c) Hydrogen (d) Oxygen.

48. Which one is the most toxic ?
(a) Carbon (b) CO (c) CO_2 (d) SO_2.

49. BOD is
(a) Biological oxygen deficit (b) Biosphere oxygen demand
(c) Biological oxygen demand (d) None of the above.

50. Pollution can bring about change in

(a) Biogeochemical cycling (b) Abiotic environment

(c) Biotic environment (d) None of the above.

52. Which one is the major reason for pollution in big cities?

(a) Fossil-fuel (b) Acid rain (c) Heat dispersion (d) None of the above.

53. World environment day is

(a) 28th Feb. (b) 5th June (c) 7th Aug. (d) 10th April.

53. Heat islands are formed by

(a) Water pollution (b) Air pollution (c) Land pollution (d) All the above.

54. Biodegradable pollutant is

(a) Plastic (b) Asbestos (c) Sewage (d) Mercury.

56. Minamata disease is due to pollutant

(a) Lead (b) Mercury (c) Hydrogen sulphide (d) Sulphur dioxide.

57. Water pollution is due to

(a) Sulphur dioxide (b) Carbon dioxide (c) Oxygen (d) Industrial discharges.

58. Which one is found in higher concentration in the atmosphere?

(a) Ozone (b) Nitrogen oxides

(c) Carbon dioxide, carbon monoxide and sulphur dioxide (d) All the above.

59. Pollution is rising due to

(a) Rain (b) Research institutes

(c) Population explosion (d) Automobiles and Industries.

60. Pollution can be checked through

(a) Reducing discharge of waste (b) Increasing industrial development

(c) Throwing wastes in open spaces (d) All the above.

61. Eutrophication causes reduction in

(a) Dissolved hydrogen (b) Dissolved oxygen

(c) Dissolved salts (d) All the above.

62. Continuous sewage flow into a stream would lead to

(a) Eutrophication (b) Algal bloom (c) Depletion of oxygen

(d) Increase in temperature.

63. Atmospheric carbon monoxide concentration becomes harmful at

(a) 0.5, 2 mm Hg (b) 0.4, 7 mm Hg (c) 0.3, 5mm Hg (d) 0-1, 0-7 mm Hg.

64. MIC and Chernobyl tragedies occurred at

(a) Bhopal 1984, Ukraine 1990 (b) Bhopal 1984, Ukraine 1988

(c) Bhopal 1984, Ukraine 1986 (d) Bhopal 1986, Russia 1988.

65. Country contributed maximum to hole formation in ozone layer is

(a) U.S.A (b) Russia (c) Germany (d) Japan.

66. Sewage infection of water will be demonstrated by cysts of

(a) Entamoeba (b) Escherichia coli (c) Pseudomonas (d) Leishmania.

67. Chlorofluorocarbon releases a chemical harmful to ozone

(a) Fluorine (b) Chlorine (c) Nitrogen peroxide (d) Sulphur dioxide.

68. Measurement of rate of oxygen utilisation by a unit volume of water over a period of time is to measure

(a) Fermentation (b) Biogas generation (c) Biosynthetic pathway

(d) Biological oxygen demand.

69. Increasing skin cancer and high mutation rate are due to

(a) Acid rain (b) Ozone depletion (c) CO pollution (d) CO_2 pollution.

70. Sudden mass death of fish is more likely to occur in

(a) Eutrophic lake (b) Mesotrophic lake

(c) Oligotrophic lake (d) Oxalotrophic lake.

71. Which pollution causes jaundice?

(a) Water (b) Air (c) Land (d) Thermal.

72. Radioactive Sr-90 can enter and accumulate in human body through

(a) Breathing in contaminated air (b) Drinking water

(c) Soil (d) Food chain.

73. Ozone day is

(a) January, 30 (b) September, 16 (c) April, 21 (d) December, 25.

74. Aerosols having carbon and fluorine compounds are chiefly released by

(a) Refineries (b) Automobiles (c) Industries (d) Jets.

75. Oxides of sulphur and nitrogen are important pollutants of

(a) Water (b) Air (c) Soil (d) All the above.

76. Air pollution affects

(a) Leaves (b) Roots (c) Stem (d) Flowers.

77. Which pollutant causes leaf curling?

(a) CO (b) H_2S (c) O_3 (d) SO_2.

78. Water pollution causes

(a) Increased photosynthesis (b) Increased deoxygenation and turbidity

(c) Decreased turbidity (d) Increased oxygenation.

79. Natural sink of stratospheric ozone is

(a) Sulphuric dioxide (b) Sulphur fluxes of oceans

(c) Freons (d) HCFCs.

80. Major source of methane in India is

(a) Rice fields (b) Sugarcane plantation (c) Wheat fields (d) Fruit orchards.

81. Ozone hole is maximum over

(a) Europe (b) Antarctica (c) India (d) Africa.

82. In coming years, skin related disorders will become more common due to

(a) Excessive use of detergents (b) Water pollution

(c) Air pollution (d) Depletion of ozone layer.

83. Phosphate pollution is caused by

(a) Weathering of phosphate rocks only (b) Agricultural fertilizers

(c) Phosphate rocks and sewage (d) Sewage and agricultural fertilizers.

84. Common indicator organism of water pollution is
(a) Escherichia coli (b) Cholerea vibrio
(c) Salmonella typhi (d) Entamoeba hislolytica.

85. Which pigment protects plants from UV damage ?
(a) Chlorophyll (b) Xanthophyll (c) Carotenoids (d) Phycocyanin.

86. Component of smog is
(a) O_3 (b) PAN (c) PPN and PBN (d) Both a and b

87. Indiscriminate use of fertilisers causes
(a) Air pollution (b) Water pollution (c) Land pollution (d) All the above.

88. Most harmful type of environmental pollutants are
(a) Human organic wastes (b) Natural nutrients in excess
(c) Waste animal feed (d) Non-biodegradable chemicals.

89. Cadmium pollution is associated with disease
(a) Anaemia (b) Itai-itai (c) Minamata (d) Pneumoconiosis.

90. Which is not dangerous for life?
(a) Nuclear blast (b) Deforestation (c) Ozone layer (d) Biopollutants.

91. Spraying DDT on crops shall produce pollution of
(a) Air and water (b) Air and soil (c) Crops and air (d) Soil and water.

92. Sewage water is purified by
(a) Microorganisms (b) Light (c) Fishes (d) Aquatic plants.

93. SO_2 pollution causes
(a) Plasmolysis (b) Destruction of cell wall
(c) Destruction of Golgi bodies (d) Destruction of chlorophyll.

94. Sewage treatment in which a portion of decomposer bacteria present in waste is recycled into the beginning of the process
(a) Cyclic treatment (b) Activated sludge treatment
(c) Primary treatment. (d) Tertiary treatment.

95. Carbon monoxide, emitted by automobiles, prevents transport of oxygen in body due to
(a) Combining with oxygen to form carbon dioxide
(b) Destruction of haemoglobin
(c) Preventing reaction between oxygen and haemoglobin
(d) Forming stable compound with haemoglobin.

96. Warm ocean surge or Peru current that recurs after 5 — 8 years in East Pacific along South America is
(a) El Nino (b) Aye Aye (c) Mangox (d) Gulf Stream.

97. Ozone hole refers to
(a) Hole in ozone layers (b) Reduction in thickness of ozone layer in stratosphere
(c) Reduction of thickness of ozone in troposphere
(d) Increased concentration of ozone.

98. Photochemical smog is related to pollution of
(a) Air (b) Water (c) Soil (d) None of the above

99. Most important causative pollutant is
(a) Plastic (b) Glass junk (c) Iron junk (d) Detergents.

100. Among pollutants which has the most lasting effect
(a) Carbon monoxide (b) Pesticides
(c) Sulphur dioxide (d) Smoke from chimneys.

101. Thermal pollution is more prevalent near
(a) Hot water springs (b) Coal-based power plants
(c) Temperate zones (d) Tropical zones.

102. Pollution-indicator plants
(a) Are resistant to pollution (b) Can purify the atmosphere
(c) Are very sensititve to pollutants (d) Can indicate onset of rains.

103. Most hazardous metal pollutant automobile exhaust is
(a) Mercury (b) Lead (c) Cadmium (d) Copper.

104. Photochemical smog always contains
(a) Ozone (b) Methane (c) Carbon monoxide (d) Carbon dioxide.

105. Depletion of ozone layer is due to
(a) Oxides of nitrogen (b) Oxides of carbon
(c) Oxides of sulphur (d) None of the above.

106. Use of lichens in case of pollution is
(a) Treatment of pollutant water (b) Bioindicators of pollution
(c) Promote pollution (d) Lichens have no relation with pollution.

107. A secondary pollutant is
(a) CO (b) CO_2 (c) PAN (d) Aerosol.

108. DDT is
(a) Biodegradable pollutant (b) Nondegradable pollutant
(c) Not a pollutant (d) An antibiotic.

109. Most inhabitants of Kolkata suffer from bronchitis. It is due to excess
(a) Adulteration of food (b) Impurity of water
(c) Polluted air (d) Polluted soil.

110. Peeling of ozone umbrella is due to
(a) CFCs (b) PAN (c) CO_2 (d) Coal burning

111. Ozone layer of stratosphere requires protection from indiscriminate use of
(a) Fungicides, insecticides, bactericides and medicines
(b) Aerosols and high flying jets
(c) Atomic explosions and industrial wastes
(d) Baloons and turbo-prop aeroplanes.

112. Environmental pollution affects
(a) Biotic components (b) Plants only (c) Man only
(d) Biotic and abiotic components of environment.

113. Green muffler is related to pollution of
(a) Air (b) Soil (c) Noise (d) Water.

114. Anxiety and stress are caused by
(a) Air pollution (b) Noise pollution (c) Water pollution (d) Nuclear pollution

115. Water pollution is due to
(a) Agricultural discharges (b) Sewage and other wastes
(c) Industrial effluents (d) All the above.

116. Pollutant released by jet planes is
(a) Fog (b) Aerosol (c) Smog (d) Colloid.

117. Carbon monoxide kills because it destroys
(a) Haemoglobin (b) Phytochrome (c) Cytochrome (d) Both a and b

118. Chlorofluorocarbons are air-polluting agents. They are produced by
(a) Acid batteries (b) Diesel trucks (c) Aerosols (d) Jet planes

119. Water is often treated with chlorine to
(a) Increase oxygen content (b) Kill germs
(c) Remove hardness (d) Remove suspended particles.

120. Water blooms are formed by
(a) Lemna (b) Hydrilla (c) Water Hyacinth (d) Planktonic algae.

121. DDT concentration recorded in human body has been
(a) 0.3 — 0.7 ppm (b) 1.3 — 3.1 ppm (c) 13 — 31 ppm (d) 30 — 70 ppm.

122. Lead is considered mainly
(a) Soil pollutant (b) Water pollutant (c) Air pollutant (d) Noise pollutant.

123. Aerosols decrease primary productivity by
(a) Decreasing O_2 concentration (b) Competing with CO_2
(c) Preventing N_2 fixation (d) Reducing photosynthesis.

124. Mottling of teeth is due to presence of an element in drinking water
(a) Mercury (b) Fluorine (c) Boron (d) Chlorine.

125. Which one of the following is not pollutant ?
(a) CO_2 (b) CO (c) SO_2 (d) NO_2.

126. As it passes into food chain, the concentration of DDT
(a) Remains same (b) Decreases (c) Increases (d) Unpredictable.

127. NEERI is
(a) National Environmental Engineering Research Institute
(b) National Ecological and Environmental Research Institute
(c) National Ethological and Ecological Research Institute
(d) National Eugenics and Ecological Research Institute.

128. A person has impaired nervous system and signs of madness due to continued intake of metal contaminated water. The metal is
(a) Mercury (b) Calcium (c) Manganese (d) Lead.

129. Methane gas producing field is
(a) Wheat field (b) Paddy field (c) Cotton field (d) Groundnut field.

130. Photochemical smog is caused by
(a) CO (b) CO_2 (c) O_3 (d) NO_2

131. Which one is not biodegradable
(a) Radioactive substances (b) Bagasse (c) Molasses
(d) Agricultural wastes.

132. Eutrophication is caused by
(a) Lack of algae in a lake (b) Abundant oxygen in ponds
(c) Run-off of fertilizers in lake (d) Excess nekton in lake.

133. Ozone hole is caused by
(a) Acetylene (b) Ethylene (c) Chlorofluorocarbons (d) Methane.

134. BOD (biological oxygen demand) is
(a) Amount of oxygen consumed by microorganisms for decaying organic matter per unit volume of water.
(b) Amount of CO_2 consumed by microorganisms per unit of sewage water
(c) Amount of oxygen required by aquatic plants for survival
(d) None of the above.

135. Treatment of polluted water is carried out with the help of
(a) Lichens (b) Fungi (c) Ferns (d) Phytoplankton.

136. Eutrophication is found in
(a) Agricultural land near thermal plant (b) Saline soil (c) Lake (d) Mountain.

137. Automobile exhaust gas that causes major respiratory problem is
(a) CO (b) CH_4 (c) NO_2 (d) Chlorine

138. Result of ozone hole is
(a) Green house effect (b) Global warming
(c) Acid rain (d) UV radiations reach the earth.

139. A lake receiving nutrients would be
(a) Oligotrophic (b) Eutrophic (c) Sink (d) Rich in fossils

140. Intensity of sound in normal conversation is

(a) 10–20 dB (b) 30–60 dB (c) 70–90 dB (d) 120–150 dB

141. Degradable pollutant is

(a) Domestic waste (b) DDT (c) Mercury salt (d) Aluminium foil

142. Exposure to noise pollution causes

(a) Increased heart beat (b) Constriction of blood vessels

(c) Dilation of pupil (d) All the above.

143. Acid rain is caused by

(a) SO_2 and SO_3 (b) SO_2 and CO (c) NH_3 and CO (d) SO_2 and NO_2

144. Lichens are sensitive to

(a) Noise pollution (b) Air pollution (c) Water pollution (d) Nuclear pollution

145. Acid rain is the secondary effect of

(a) Sound pollution (b) Soil pollution (c) Air pollution (d) Water pollution

146. Maximum greenhouse gases are released by

(a) India (b) Britain (c) U.S.A. (d) France.

147. Greenhouse effect is due to

(a) X-rays (b) UV rays (c) Green rays (d) Infra-red rays

148. Polluted waters do not contain

(a) Stone Fly Larvae (b) Sewage fungus (c) Water Hyacinth (d) Cyanobacteria

149. DDT has been a major pollutant because it

(a) Kills aquatic animals (b) Kills pests

(c) Destroys many valuable species (d) Is nondegradable.

150. Pollutant which causes acid rain is

(a) SO_2 (b) CO_2 (c) CO (d) Hydrocarbons

151. Which of the following gases contributes to global warming

(a) Nitrogen dioxide (b) Carbon dioxide

(c) Carbon monoxide (d) Sulphur dioxide.

152. Fertilisers added to fresh water will cause

(a) Death of plants (b) Decrease in fish population

(c) Increase in aquatic animals (d) Eutrophication.

153. Minamata and itai-itai are caused by pollution of

(a) Mercury and Lead (b) Mercury and Cadmium

(c) Lead and Tin (d) Lead and Strontium.

154. Pollution indicator is

(a) Agrobacterium (b) Lichen (c) Pteridium (d) Both a and b.

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155. A water body has high BOD indicating that water is

(a) Being contaminated with sewage (b) Being aerated

(c) Receiving minerals (d) Atrophic.

156. Eutrophication is a type of

(a) Land pollution (b) Air pollution (c) Water pollution (d) Noise pollution.

157. Heat that radiates back from greenhouse gases (green house flux) causes

(a) Additional global warming (b) Thermal inversion

(c) Eutrophication (d) Smog.

158. Lichens do not occur in areas with

(a) Pollution (b) Humidity (c) Low temperature (d) High temperature.

159. Pollutant that reduces O_2-carrying capacity of blood is

(a) SO_2 (b) CO (c) CO_2 (d) None of the above.

160. Affinity of CO for haemoglobin as compared to O_2 is

(a) Two times (b) Twenty times (c) 100 times (d) 200 times.

161. Water pollution

(a) Increases turbidity and deoxygenation (b) Decreases turbidity

(c) Increases oxygenation (d) Increases photosynthesis.

162. Nutrient enrichment of water bodies causes

(a) Stratification (b) Eutrophication (c) Succession (d) None of the above.

163. Which is regional pollution

(a) Smog (b) Acid rain (c) O_3 layer depletion (d) Both a and b.

164. Acid rain will not affect

(a) Lithosphere (b) Plants (c) Ozone layer (d) Animals.

165. Biological magnification occurs in case of

(a) Organochlorine insecticides (b) Organophosphate pesticides

(c) Plants and animals in ecosystem with abundant resources

(d) Photography.

166. Hay fever is caused by

(a) Hepatitis (b) Dengue (c) Allergy (d) Helper T-cells.

167. Ulcosis occurs due to

(a) Acid rain (b) Ozone depletion (c) Inhalation of aerosols

(d) Inhalation of SO_2.

168. Effect of pollution is marked first in

(a) Microorganisms (b) Vegetation (c) Food crops (d) None of the above.

ANSWER

1. (b) 2. (c) 3. (b) 4. (a) 5. (b) 6. (a) 7. (a) 8. (b) 9. (c) 10. (b) 11. (b) 12. (b) 13. (a) 14. (a) 15. (b) 16. (c) 17. (c) 18. (b) 19. (a) 20. (b) 21. (c) 22. (b) 23. (a) 24. (d) 25. (d) 26. (c) 27. (b) 28. (d) 29. (a) 30. (a) 31. (a) 32. (a) 33. (d) 34. (a) 35. (c) 36. (b) 37. (c) 38. (c) 39. (a) 40. (c) 41. (b) 42. (c) 43. (b) 44. (a) 45. (c) 46. (a) 47. (b) 48. (b) 49. (c) 50. (c) 51. (a) 52. (b) 53. (b) 54. (c) 55. (b) 56. (d) 57. (c) 58. (d) 59. (a) 60. (b) 61. (c) 62. (d) 63. (c) 64. (a) 65. (a) 66. (b) 67. (d) 68. (b) 69. (a) 70. (a) 71. (d) 72. (b) 73. (d) 74. (b) 75. (a) 76. (d) 77. (b) 78. (c) 79. (a) 80. (b) 81. (d) 82. (d) 83. (a) 84. (c) 85. (d) 86. (b) 87. (d) 88. (b) 89. (c) 90. (d) 91. (a) 92. (d) 93. (b) 94. (d) 95. (a) 96. (b) 97. (a) 98. (d) 99. (b) 100. (b) 101. (c) 102. (b) 103. (a) 104. (a) 105. (b) 106. (c) 107. (b) 108. (c) 109. (a) 110. (b) 111. (d) 112. (c) 113. (b) 114. (d) 115. (b) 116. (a) 117. (c) 118 (b) 119. (d) 120. (c) 121. (c) 122. (d) 123. (b) 124. (a) 125. (c) 126. (a) 127. (d) 128. (b) 129. (d) 130. (a) 131. (c) 132. (c) 133. (a) 134. (d) 135. (c) 136. (a) 137. (d) 138. (b) 139. (b) 140. (a) 141. (d) 142. (a) 143. (b) 144. (c) 145. (c) 146. (d) 147. (a) 148. (d) 149. (a) 150. (b) 151. (d) 152. (b) 153. (b) 154. (a) 155. (c) 156. (a) 157. (a) 158. (b) 159. (d) 160. (a) 161. (b) 162. (d) 163. (c) 164. (a) 165. (c) 166 (c) 167. (c) 168. (b)

Fill up the blanks :

Q.1. The instrument that determines any earthquake is called——and its unit of measurement is——.

Ans. Richter scale, Richter.

Q.2. The temperate forest lies between —— and —— latitudes in both the hemispheres.

Ans. 30°, 50°.

Q.3. Narmada project is located in——and——states.

Ans. Gujrat, Madhya Pradesh.

Q.4. Decline in Demographic Qoutient indicates——in standrd of living.

Ans. increase.

Q.5. The Envoronment (Protection) Act was enacted in the year——.

Ans. 1986.

Q.6. Increase of —— (gas) causes global warming.

Ans. Green house.

Q.7. —— is a study of Animal behaviour.

Ans. Ethology.

Q.8. Full forms of UNEP and IUCN are —— and —— respectively.

Ans. United Nations Environment programme, International Union for Conservation of Nature and Natural resources.

Q.9. The Convention to safegrard Ozone layer depletion was held at—— Canada.

Ans. Montreal

Q.10. Chipko Movement was initiated by ——.

Ans. Local tribal people in Uttarkhand of UP.

Q.11. One of the major environmental movement is——

Ans. Narmada Bachao Andolan (NBA)

Very Short Answer type Questions

Q.1. Which organisatian did launch a movement against the silent valley project :

Ans. KSSP (Kerala Shastra Sahitya Parisad).

Q.2. What is Safety level ?

Ans. Safety level Indicates the quality standard of the environment (air, water) which se no adverse psychological and physiological impact on human beings.

Q.3. What is 'Chipko Movement' ?

Ans. This was a movement for forest conservation Carried out by the local tribal women in Uttarakhand of U.P.

Q.4. What is land slide?

Ans. Land slide is also known as subsidence.

A fall of land or rock from a hill side or cliff is known as landslide.

Q.5. What was the main demand of chipco movement ?

Ans. Chipco movement was a movement for forest conservation. The local tribal women in Uttarakhand of U.P. refused the loggers of the contractors to cut the trees.

Q.6. In which state in India is located the 'Silent valley':

Ans. Kerala (Palghal, a district of North Kerala).

Q.7. Cite one example of environmantal disaster in India.

Ans. Earthquake (on 26th January 2001 at 8-30 am at Gugrat), A Deadly Cyclone hit the coastal region of orissa in 1999.

Q.8. Which Law is in force in India to prevent and control water pollution?

Ans. Water Act (Prevantion and Control of pollutiom), 1974 (Amended in 1988).

Q.9. What do you mean by pubic liability Insurance ?

Ans. It is the Act formulated by Govt. of India in 1991 to provide immediate relief to the persons affected by accidents occurred due to handling of any hazardous substance.

Q.10. What is the meaning of environment under the environment (Protection) Act ?

Ans. Environment means the interrelationship which exists among and between air, water and land, and human beings, other living organisms plants, micro-organisms and property.

Q.11. Which legislation was enacted in India after Rio-de Janeiro conference?

Ans. The Protection of Human Rights Act' 1993.

Q.12. Mention two environmental Movements.

Ans. Chipco Movement (Uttarakhand, U.P.), Silent valley Movement (Kerala).

Q.13. Who is the author of the book 'Silent spring'.

Ans. Smt. Rachel Carson.

Q.14. Write the meaning of green revolution ?

Ans. The scientific process of food production which had been started since 1966—67 by using high yielding seeds, manures, pesticides etc is known as green revolution.

Q.15. 'What do you mean by 'Ozone hole' ?

Ans. Presence of 'ozone hole' was first invented by Dr. Jo Foreman, 1982. CFC and oxides of nitrogen are responsible for 'Ozone hole'. Main factors of ozone depletion are CFCS wrich transfomed in molecules gas and in presence of ice crystal breaks into chlorine molecules, chlorine atom destroys at least ten thousand atom molecules. In this way a hole ocurrs in ozone layer is known as "ozone hole".

Short Type Question Answer

Q.1. What is land degradation?

Ans. Excessive grazing of animals, cultivation, deforestation, flowing of river, rain water and high velocity of wind are the causes which make the soil weak and reander the soil erodable. This process is known as land degradation.

Q.2. What do you mean by crop-rotation ?

Ans. Cultivation of different type of crops in an agricaltural field (one after another) is known as crop-rotation. This process of cultivation is fruitfull for protection of harmful insects and soil fertility.

Q.3. What is Aquifer ?

Ans. Under ground layer of Porous material (sand) containing ground water is known as Aquifer. This layer is situated above the solid impermiable layer. The water of aquifer may be withdrawn through wells for human use.

Q.4. What is EIA ?

Ans. EIA means Environmental impect assessment.

The process of survey and calculation (assessment) of the impact of any industry or enviroment or evalution about furture impact of any eonomical programme on environment is known as EIA.

Q.5. What is social forestry ?

Ans. It is generally a forestry outside forest boundaries and designed for the benefit of a community as opposed to an individual and the objective of it take into account the basic and economic needs of the comunity aimed at bettering the living condition of rural people. Forestry for Community development is named as social forestry.

Q.6. What is organic farming ?

Ans. Farming without use of chemical pesticides or chemical fertilizers is known as organic farming. The organic farming means producing crops and Livestock naturally by using organic fertilizers and natural pest control methods.

Q.7. What is Montreal protocol ?

Ans. International real success on ozone layer protection and resolution to reduce CFC (responsible for ozone layer depletion) step by step was achieved in 1987 through montreal protocol convention. 40Nations took part in the convention and 30 of these fully agreed on the decisions. This is known as montreal protocol.

Q.8. Define Rad ?

Ans. The unit of absorbed dose of ionizing radiation is called 'Rad'.

1 Rad=10Q ergs energy absorbtion per gm. of irradiated material.

Read the following passages and darken the circle/circles corresponding to the correct statement(s).

Passage 1

The aim of the Stockholm Conference was to lay emphasis on basic concepts such as the quality of life, environmental knowledge and awareness and participation of people. The first international conference in India on environmental education was held in 1981. The Bhopal gas tragedy in 1984 was a wake-up call that alerted the Government of India to the need for disaster management and environmental awareness and education at all levels of society. So in 1999 the Supreme Court of India issued orders to the Central Government for the introduction of a common course of Environmental Studies at the under graduate level for different streams in all colleges and Universities.

Statement 1 : The first international conference on environmental education in India took place in 1981.

Statement 2 : The Government issued the order to start a common course on environmental studies.

Statement 3 : The Bhopal Gas tragedy was a wake-up call for the Government of India to introduce disaster management and environmental awareness to society

Ans. ● ○ ●

1 2 3

Passage 2

Despite the urgency and importance of environmental issues, building cooperation to address global environmental problems is not simple. It involves contentious issues such as the division of responsibilities and differing capabilities to respond. . Industrial countries have created many of the international environmental problems. In the pursuit of economic advance, they have destroyed much of their biodiversity and have over-exploited fisheries worldwide. They also have the highest level of energy use and thus bear the overwhelming responsibility for the present level of man-made green house gases in the atmosphere. At the same time, developing countries are unlikely to become actively involved in addressing global environmental problems for slower economic progress. The United Nations Framework Convention on Climate Change and the Convention on Biological Diversity specifically recognized that economic and social development and poverty eradication are overriding priorities of the developing countries. It follows that there is a strong need for transfer of resources from rich to poor countries in order to solve global environmental problems.

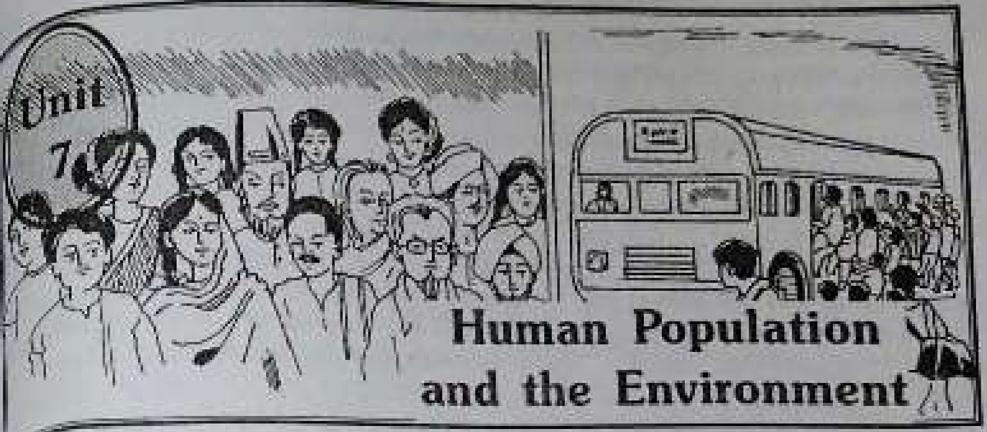
Even though industrial countries have played a disproportionately large role in causing global environmental problems and should pay the lion's share of the costs of addressing them, developing countries are vital to any long-term solution to these problems and have accepted that they also have a role, under a system of common and differentiated responsibilities. Developing countries are already doing damage to the global commons. Rainforests and coral reefs are rapidly destroyed in many developing countries. Urbanization, industrialization and growing number of automobiles worldwide mean yet more green house gases in the atmosphere. Overfishing has spread to seas controlled by developing countries. Both developed and developing countries have a stake in the global commons and, therefore, both have a strong interest in ensuring that cooperative steps are taken to address these issues. The cooperative spirit is manifest in the efforts now being made to tackle global environmental problems in a multinational framework. Since the 1972 Stockholm Conference on the Human Environment, governments have signed more than 130 environmental treaties, with increasingly substantive regulatory provisions. These treaties have contributed to many positive developments.

Statement 1 : For solving global environmental problems there is need for transfer of resources from rich to poor countries.

Statement 2 : Only developing countries are responsible for the destruction of global biodiversity and natural resources.

Statement 3 : In future both developed and developing nations will take collective responsibility for the betterment of global environment.

Ans. ● ○ ●
1 2 3



Unit 7

Human Population and the Environment

7.1 Population Growth

By population, we mean Human population. In the Biosphere, man is the most special creature and is now controlling the Biosphere. The total population of the World has now exceeded more than 650 crores. In the march of time, many civilisations and populations like Indus Valley Civilisation have perished due to natural disasters.

7.2 Growth of Population

In-spite of adverse and natural calamities, man has not lost enthusiasm and interest in life. With greater tenacity, zest and zeal, human being is propagating agriculture, industries, urban and rural developments. For bare subsistence of life, we are collecting leaves and roots and other plant-parts including juice for the preparation of life-saving drugs. Men, are exploring all possible work for sustainable development in all spheres of life as eco-friendly members of nature.

7.3 Concept of sustainable development

Sustainable development is a new topic for human civilisation. From the very dawn of civilisation, men have improved themselves by their experiences. Production and enjoyment of life have begun enormously in many countries but they had no uniform development throught the world.

If we observe the development critically, we may infer that this development is not environment-based. Huge natural resources like iron ores, petroleum, coals, etc., were freely used for the human civilization and development. These resources are very limited. Naturally, we cannot say that these developments are judicious.

Variation among Nations :

If we study the population growth of the developed nations of Europe and North America, we find that (1) They share the long history of very slow growth-rate over thousands of years, during which the birth and death rates must have been roughly equal; (2) In the 17th and 18th centuries their death rate decreased due to better sanitation and health care ; and (3) within the next few decades, their birth rates also began to decline, and the population growth rate decreased. Such a decrease, first in the death rates, resulting in increased growth rates, then thereafter the decrease in the birth rates, resulted in the fact that birth and death rates once again became roughly equal it is called demographic transition which results in very low or zero growth rates.

On the other hand, the less developed countries, did not begin to benefit from better health care and sanitation until after the Second World War. Though their death rates have declined sharply their birth rates after the 2nd World War have not decreased sufficiently, with a few exceptions. Therefore, their growth rates have increasd to above 2%, in some cases 3%, with doubling times of 24-35 years.

The demographic characteristics of the developing and developed countries.

Demographic characteristics of developed and developing countries

Characteristics	Developing countries	Developed countries
(0-1) years per 1000 live births.		
Growth Rate	High (2.1%)	Low (0.6%)
Doubling Time	Low (33 years)	High (116 years)
Infant Mortality	High (50 - 100)	Low (5 - 25)
Income in VSS Per Capita	Low to moderate (200-3000)	High (3000-14000)
Energy Use Per Capita	Low	High
Life Expectancy in the initial the Years at Birth	Low (40 - 50)	High (69 - 75)
Daily Food Intake in Calories per Person	Low (1500-2700)	High (3100-3500)
Literacy	Low to moderate (25 - 75%)	High (above 95%)
Industrialisation	Low	High
Population mainly	Rural (66%)	Urban (72%)
Standard of Living	Low	High

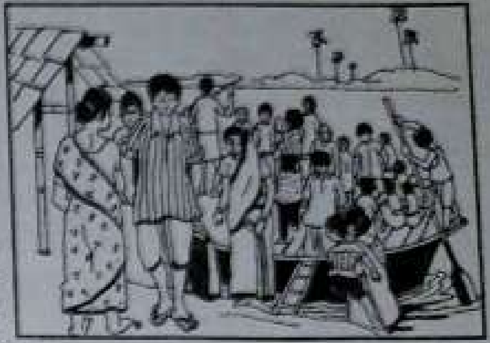
POPULATION EXPLOSION

(a) Every region or state has an intrinsic capacity to assimilate various categories of population or population load so that it does not affect the sustainability of the region.

The maximum rate of resource consumption and waste-discharge depend upon the growth of population of a state. As matter of fact population policy should be established without impairing bio-productivity and ecological integrity of the region. If we consider the carrying capacity of a particular state or a region it is described as the number of persons

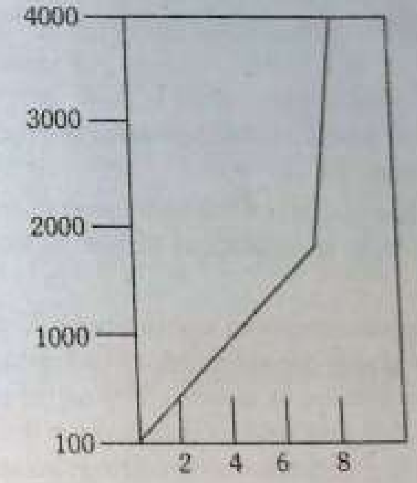
can be supported by a unit area or land while assimilating the wastes. Without a population policy a state may suffer from the problems and symptoms of over-population. The people will suffer from malnutrition and poverty and the state should expect environment degradation.

(b) The human population is growing geometrically. We know that each generation is growing as a multiple of the previous one (such as 1,2,4,8, 16 and so on). But food production on the other hand, increases arithmetically (such as 1,2,3,4, and so on). So there is almost always an imbalance between increasing food supply and increasing population, which is the main symptom of over-population. Sooner or later a certain portion of the population will be destroyed due to lack of food.



When the size of the population of a country exceeds the carrying capacity of its environment, we say that the country is over populated. It is supposed that the excess portion of the population that cannot be supported by the available food, water, and space in the environment will die from disease and starvation or malnutrition.

(c) In the long run, population growth creates a serious problem—loss of ecological balance, natural calamities such as earthquakes and floods. The loss of ecological balance also affects rainfall and crop production. Deforestation adversely affects rainfall. Inadequate rainfall leads to food shortage and creates famines, starvation and loss of human life and



Exponential (geometrical) growth of a hypothetical population increases at an ever incresing rate.

also leads to a fall in the number of domesticated animals like goats and cows. Floods create more serious consequences—epidemics and loss of human properties.

In this context, we may refer to a new concept, "the carrying capacity of the environment." The carrying capacity of the environment for a particular population is the number of individuals of that species that the environment can support indefinitely. The population size may increase beyond this number, but it cannot stay at this increased size for a long time.

Human population can grow larger than the carrying capacity of environment but that population would degrade its environment. The ecosytem and its carrying capacity must eventually recover but this may take hundreds of years. The world's population today is consuming earth's resources faster than they can be replaced as the total population of the world is already going to be larger or greater than the earth's carrying capacity. Due to this, we apprehend population crash. It is expected that the size of the global population will ultimately stabilise as the carrying capacity of the earth is 20 billion people.

Highlight how population growth and natural resources are related?

Population growth with reference to the natural resources can be highlighted considering two conditions of environment as follows :

(i) Population growth when natural resources are not limited.

(ii) Population growth when natural resources are limited.

(i) Population growth when natural resources are unlimited : With unlimited resources and ideal environmental conditions a species can produce offspring at the maximum rate. In such condition when natural resources are unlimited the population growth is exponential. The biotic potential of the species (bacteria, insects, mice etc.) is high where resources are unlimited.

$I = rN$

The Expected increase (I) can be calculated by multiplying the rate of natural increase (r) by the current population size (N).

'J' shaped curve of population growth of a species is found when resources are abundant i.e., the early growth pattern could be exponential because at least initially the resources are unlimited.

(ii) Population growth when resources are limited : When natural resources are limited a habitat cannot support any population beyond a certain size. If the population growth is high, resource limitation shows its adverse effects on the population by increasing death rates. It will lead to a decline in population density down to the limit set by available resources in the habitat. As a population faces environmental resistance (predation, competition for resources, food shortages, disease, adverse climatic conditions and unsuitable habitat) the J-shaped curve of population growth is changed to a 'S' shaped or sigmoid curve.

POPULATION : IMPACTS ON ENVIRONMENT

Environment and Human Population Pressure :

1. Population Density— It is not the same everywhere. The developed countries have only 15% of the population while 85% human population resides in poor/developing countries. In 2000 AD, the world population was 6·1 billion. 50% of this lives below the poverty line and 20% is severely undernourished. The major problem of developing countries is how to feed the ever-increasing population. They are undertaking deforestation and bringing more and more areas under agriculture. It is leading to degradation of environment resulting in a sort of population–food–environment trap.

2. Strain on Resources— Rising population requires more fuel, clothing, dwellings, drinking water, health facilities, transport facilities, etc. This puts a strain on resources and disturbs planned utilisation as well as development for better living. The facilities would always remain poor like poor sanitation, crowded dwellings, substandard water supply, poor health facilities leading to more diseases and death.

3. Rush to Urban Areas— Developing countries like India have a large rural population where modern facilities, health, education and gainful employment opportunities are poor. Therefore, there is a regular migration from rural areas to already congested urban areas, mostly in search of material wealth. The migrants cannot afford to live in proper residential areas due to high rent. They settle down in slums where there is overcrowding, inferior living conditions, poor drainage, poor sewerage and improper water supply.

4. Intensive Agriculture— There is a pressure (as well as economics) on agricultur food on less land. It results in intensive and aggressive agricultural practices like fertilisers, pesticides and irrigation.. It leads to degradation of soil as well as environment.

5. Urban Wastes— Urban civilisation is based on consumerism. It does not produces consumes a lot of natural resources and forms large quantity of wastes. Urban wastes foreign to natural systems. Many of them are hazardous.

6. Over-consumption— Affluents have a tendency to overconsume the resources residing in urban areas consumes 80% of energy generated in India. A child in USA equal to 15–20 times than a child of a developing country.

7. Aggression and Colonialisation— 15% population of the world residing in developing consuming 85% of resources of the world. It is leading to aggressive natural resource colonisation.

RESETTLEMENT AND REHABILITATION OF PEOPLE

The development of standard and quality of living of the people of a country is related to economic development. There are different types of natural and man-made disasters that force people to move out of their land. The most serious socio-economic effect is due to large scale displacement of local people from their homeland due to construction of big dams. There are different types of economic and environmental conditions which cause several problems, when rehabilitation occur at outworld places. The problems are loss of kinship system, loss of community life, complete destruction of society networks, total loss of productive units and source of income. The resettlement and rehabilitation policy is to ensure that the people who are displaced due to construction of dams should receive benefits from it. The objectives of this policy are :

1. Employment guarantee should be given to all inhabitants,
2. The land, house infrastructure and other type of compensation should be immediately provided to the affected people.
3. Displaced people should be compensated for their actual losses and supported during the transition period in the resettlement site.
4. Community involvement in planning and implementation of resettlement should be encouraged where displacement is necessary.

Practical strategies should be formulated for resettlement and rehabilitation of those people who are displaced due to natural and man-made disasters. Today ad-hoc relief measures are taken to cope with the number of problems caused by such disasters. So, the awareness of these negative impacts are necessary, because these occur at frequent intervals.

NATURAL DISASTER

The natural facts like earthquake, volcanic eruption, cyclones, typhoon, hurricanes, tornado, flood, landslides, etc. which causes, change the atmosphere within a very short span of time and total change in the environment causing huge damages to lives and properties, are known as natural disaster.

Flood

Due to heavy and continuous rainfall when excess water of the rivers inundates both the banks of the river, flood occurs. Flood does enormous damage to man. Due to flood the environment becomes dirty and polluted. We called the occurrence of flood a natural calamity though both nature and man are responsible for the flood.

(a) Causes of Flood : The following are the causes of flood :

(1) Intensity of Rainfall in catchment area : The intensity of rainfall in the catchment area is the main cause of the flood. If the rainfall is normal and the storm duration is short, then the surface run-off water will flow down smoothly through the tributaries and rivers will not create any trouble to the downstream side.

(b) Topography of the catchment : The catchment area with steep slope increases the run-off water and increases the sediment in flow due to the high velocity of flow.

(c) Sedimentation of rivers : If the tributaries of a river carry heavy sediment load the river bed goes on silting up gradually every year. Thus, the carrying capacity of the river goes on reducing every year.

(4) Obstruction in the River Flow : In hilly catchment area, sometimes it may happen that the debries from the landslides may form an obstruction in the river valley like a dam, and thus a reservoir may be formed on the downstream side.

(5) Contraction of River Section : While constructing road or railway bridges across a river, the approach works are done on both banks which reduce the cross-section of the river.

(6) Inadequate Cross Drainge Works : In cross drainage works like aqueduct the river passes below the canal. Here, the structure which is constructed for the smooth running of the river water may be inadequate for the high flood discharge.

Effects of Flood : The following are the ill effects of flood :

(1) Damage of Property : When the villages or towns are submerged under considerable depth of water with high velocity of flow, then many houses may collapse, furniture and other valuable things may get damaged.

(b) Loss of Life : If the flood water suddenly submerges the inhabitant areas under great depth and with high velocity the loss of life (both human and cattle) is more.

(c) Waterlogging : The flood water may cause waterlogging in agricultural land making the soil alkaline in nature thereby reducing the yield of crop.

(4) Rise of Price of Foodgrains : When the road and railway communication is disrupted due to damage by flood, the movement of the foodgrains and essential commodities is hampered.

(5) Disruption of Communication : Due to the flood the culverts or bridges on the roads and railways may be damaged.

(6) Loss of Work : During flood all types of works such as building works, road works, agricultural works, etc. remain suspended.

Good Effect : The only good effect is that the agricultural land becomes enriched with silt which has got a good manure value and hence the yield of the crop becomes high.

(b) Methods of Flood Control : The following are the general methods of flood control works :

(1) Construction of check Dam : The check dams are constructed across the tributaries of river at a suitable places near the confluence point.

(b) Construction of Contour Bunds or Terrace Bunds : In hilly catchment area, the contour bunds are constructed in rows at different elevations transverse to the slope.

(c) Construction of Flood Control Reservoirs : Flood control resevoirs are formed by constructing low dams at suitable place on the course of the river.

(4) Construction of Flood Walls : When no space is available for the construction of levee or when it is not suitable to construct the levee due to the site condition, then the construction of flood walls are recommended.

(5) Construction of Diversion Channel : From the upstream side of the Flood affected area a diversion channel is excavated to connect the river with a large lake or bil (marshy land).

(6) The construction of flood-ways : The low-lying areas along the course of the river are known as flood-ways. During the flood, the river water may be diverted to these flood-ways by artificial channel.

Earthquake

The violent shaking that is perceived inside the earth for natural cause is known as earthquake. There is no definite time for the occurrence of earthquake. It may be spread from one corner of the world to another. It is observed that the intensity of the tremor which spreads over a very larger area, the force and power gradually get decreased.

(A) Natural causes of earthquake.

There is a great degree of energy below the surface of the earth which can be more violent we could not even think of. This energy is the remnant of the history of the origin of the Earth. About hundred kilometres below the Earth's surface there is a mantle, which is practically viscous. It is like a very hot lava, the heat being thousands of degree Celsius (about 6000°C). The surface of the Earth is made up of several fragments of the Earth's crust which float on the Earth's thick mantle. By studying the dynamics of the plates, better known as plate tectonics, the scientific reasons for the occurrence of earthquake could be understood.

Volcanic eruption or man-made explosions are responsible for the production of the energy of earthquake.

Most destructive earthquakes occur due to the dislocation of large masses of rocks, motion of the plates of crust or due to the geological faults. As the continents are constantly in motion, the occurrence of earthquakes are natural phenomenon. As it does not take a long time to dispense the energy stored in the rocks, the duration of earthquake is often short.

(B) Man-made causes are pumping water, oil production and mining.

Earthquakes can also occur when man-made structures like dam (water reservoirs), rock quarries, etc., increase or decrease the over-burden stress of a particular area.

Possibilities to make a forecast about the occurrence of earthquake

The following investigations are some of the efforts of the scientists to forecast about the occurrence of the earthquake.

(a) The plates under the crust of the earth are taken as one of the indicators in respect of to the directions in which they are moving, or in respect of the velocity (speed).

(b) Any rupture along the rocks and their change of direction.

(c) Any increase of the radon gas inside the well or tube-well.

(d) Any unnatural behaviour of the insects and other animals including birds.

Scientists all over the world are trying to explore the possibility of making a consensus of opinions in respect of forecast of the earthquake(s).

Detection of earthquakes

Seismographs which were invented in late eighteen century helps for detection of earthquake. By this method the magnitude of an earthquake can be detected from thousands of kilometres away.

A seismograph has a mass with a pen on it which moves over a rotating drum on the frame, leaving a line behind on the paper. The deviation of the line from the usual course, shows the magnitude of the quake.

The intensity of earthquakes is perceived mostly in urban structures. Due to it big buildings smash, steel beams bend, there are cracks in the concrete, buildings collapse consequently crushing the occupants.

Cyclone

The low-pressure area of the atmosphere is the area in which winds spirally blows inward. A cyclone may cover an area half as large as the entire United States.

Two characteristics of cyclone are (i) the atmospheric pressure is lowest at the centre, and (ii) the winds spiral toward the centre.

Direction of wind in a cyclone

We know that in the northern hemisphere the winds blow anticlockwise towards the centre. In the southern hemisphere, they blow inward in a clockwise direction.

Storms usually occur with cyclones. With the approach of a cyclone the sky becomes dull and overclouded and there is heavy rain accompanied by lightning and thunder.

Some parts of the world have so many cyclones that their average atmospheric pressure is below that of the rest of the world. For example, in the Aleutian low in the North Pacific Ocean and the Icelandic low of the North Atlantic, the pressure is low in most of the winter. Such regions may be called semipermanent low pressure centres or centre of action.

A tropical cyclone is a severe kind of cyclone that occurs over warm ocean waters in tropics. The winds of this type of cyclone are more violent and cause severe damage to life and property. This type of cyclones occur frequently in Mumbai, West Bengal, Bangladesh, the Gulf of Mexico, the Carribean west of Southern Africa and north of

Australia. Cyclones are known by different names in different parts of the world, i.e., hurricanes in the West Indies, typhoons in the China Seas and cyclones in the Indian Ocean. Storms of northern Australia are known as Willy Willies. Another type of cyclone is the tornado which often blows in the Missisipi basin in the USA. These storms may bring winds up to 290 Km. an hour, terrific rains, violent thunder and lightning. They measure 320 to 480 Km. across.

Landslides

Landslide is a natural disaster which cannot be stopped altogether, but with great tenacity can be controlled. In hilly and mountaineous regions, the landslides create great effect on man and environment.

Along the slopes of the hills, big chunk of heavy rocks, pieces of stones, soil and other loose ingredients come down heavily on the ground all on a sudden by the force of gravity creating inconveniences to all concerned. These are known as landslides. In general, in rainy season it is the common sight in the hills. Sometimes, landslides may also occur in the trail of earthquake or eruptions of volcanoes. Landslides cause enormous damages to the human society and environment. So landslide is naturally a great problem for them.

Causes of Landslide

There are some natural and some man-made causes–

(A) *Natural causes of landslides :*

(i) **Continuous rain:** This occurs in Sikkim, Darjeeling and the Himalayan regions every year during the rainy season. In the hilly regions, if there is continuous rain, soil and rock, soaked in water, become loose and heavy and by the force of gravity come down below.

(ii) **Loosening of rocks :** Due to continuous stagnancy of water, heavy blowing of wind, scorching sunrays, pressure of the roots of trees and some chemical reactions, the rocks become fissured. As a result, these weak heaps of rocks go down below as landslides in the hilly regions :

(iii) At the time of earthquakes and volcanic eruptions, lava come out in great force; soils tremble continuously, ultimately culminating in landslides.

(iv) Due to presence of large number of sand in the soil, water may enter easily inside the soil and ultimately landslides occur there; as in the case of Darjeeling, Sikkim and the other hilly areas.

(B) *Man-made causes of landslides :*

(i) **Lack of forest on the soil :** If there is ruthless destruction of trees, naturally on the soils, there is no covering of vegetation. Under this condition rainwater continuously enter inside the soil. As a result, soil becomes loose and weak. Landslide is the ultimate result of this circumstance.

(ii) **Construction work in the weak slopes of the hills :** If there is a regular practice of construction of unplanned houses, roads, etc., in the weak and steep hilly and mountaineous regions, planting of deep-rooted trees, accumulation of garbages along the slopes at the hills, may also cause landslides in the areas, as was evidenced many times in Darjeeling, Kurseong, Gangtok and other hilly areas.

Landslide is a natural phenomenon which has become a thorny problem to man and environment now-a-days. With increase of heavy population in the areas and setting up of Tea gardens, Apple and Orange orchards, etc., and unscientific construction of houses and roads are enormous problems are caused to the inhabitants of the locality including loss of life, property as well as healthy environment.

Effects of landslide/on Environment :

(i) Due to the landslides vegetation of the effected area(s) are greatly disturbed, thereby complete destruction of natural forest(s) takes place.

(ii) As a result of landslides, soils become full of sand, stonechips and particles of gravel and quality of soil is destroyed and slopes of the hills get filled with hard rocks.

(iii) The slopes of the hills suffer a lot by landslides and the slopes become more steep and weak as well. Naturally, construction of houses and roads are not possible there.

(iv) Sometime landslides in the hilly regions come down to the midst of the river and become stagnant there. In the rainy season, due to the pressure of flood water, the bund(s) become cracked and there is a spate of flood water on both the banks of the river. Exp : flood in 1968 in Teesta river in the district of Jalpaiguri.

(v) There is enormous erosion of soil due to landslide.

Control of landslide

(i) Meticulous planning is required for building of houses and roads. Landuse methods should be taken into confidence.

(ii) Soil testing and other geological investigations are necessary to control landslide.

(iii) To prevent landslides garbages, etc., should not be thrown on the slopes of the hills.

(iv) Dwelling houses should be built for rehabilitation of the people at the time of emergency.

(v) Latest techonologies should be used for regular drainage in landslide-prone areas, where there is a chance of accumulation of water.

(vi) In hilly areas walls should be erected to the slopes of the hills, which are weak, using scientific methods. This may be of concrete and/or chunk of rocks. This should be wrapped up with net or barbed wire.

(vii) Plantation of trees should be initiated and illegal felling of trees should be avoided.

(viii) People of the landslide-prone areas should be properly trained and awareness programme should regularly be launched about the danger and ill effects of landslides and their protective measures.

CASE STUDY

After regular spraying of DDT for few years in long islands in USA, the population of fish-eating birds began to decline. Later, it was found that the concentration of DDT had increased 800 times in the phytoplankton relative to the concentration in water, zooplankton contained about 5 times higher concentration than phytoplankton, different fishes had 9–40 times greater concentration than the zooplankton and birds contained about 25 times higher DDT concentration relative to that in fishes.

A crippling deformity called **Minamata disease** due to consumption of fish caught from mercury-contaminated Minamata Bay in Japan was detected in 1952. Water contaminated with cadmium can cause **itai-itai disease,** also called **ouch-ouch disease** (a painful disease of bones and joints) and cancer of lungs and liver. The compounds of lead cause anaemia, headache, loss of muscle power and bluish line around the gum.

Chernobyl disaster

In 1986, a very awful Nuclear accident occured on 26th April in Chernobyl, Ukraine (Russia). Two gas explosions in one of the four graphito-controlled, water-cooled reactors in the nuclear power plant, north of Kiev blew the roof of the building and set the graphite on flames. The accident happened presumably due to mishandling of the reactor. So, it may be termed as human error. Releasing a very large amount of radiation on the farms and urban areas in the vicinity of the reactor, which subsequently spread throughout the greater part of Europe, the disaster was virtually caused by the men in charge, who were doing some tests on the reactor. The tragedy occurred when the operators deliberately turned off some of the reactor's automatic safety devices to investigate the safety equipment, which they were not supposed to perform legally or technically. As a result of the explosion, radioactive debris spread into the air spread over thousands of square kilometres of lands of Ukraine in Russia togetherwith the adjacent countries. In the aftermath of the disaster, many fire-fighters and workers of the plant died of radiation sickness. After the accident about 150,000 people within the radius of about 35 kilometres of the plant were readjusted and rehabilitated. There are many people who were exposed to high degree of radiation. The accident threatened crores of livestocks and farms and it was predicted that about a lakh of people would die from cancer in near future. People have completely lost their faith about the solution of the electricity problem by Nuclear power. In the political circles also, there was adverse criticism.

Bhopal Gas Tragedy : A Case Study

On December 3, 1984 in Bhopal India, world's most deadliest gas pollution occurred due to the escape of methyl isocyanate (MIC) gas in the air. It is a toxic gas (an intermediate product of a pesticide, sevin) and blasted of a large storage tank of the American multinational corporation, Union Carbide. In order to prevent polymerisation of MIC it is stored with phosgene. Accidental addition of water causes phosgene to react and to produce HCl which catalyses polymerisation of MIC. An enormous amount of heat was produced and 40 tonnes of MIC was released.

As the MIC came out of the tank, it changed into a gas. Plant workers were unable to stop the leak or neutralise the gas as all the things went out of control.

The gas that leaked from the tank killed 3,000 residents of Bhopal. An additional 3,00,000 people suffered damage to their eyes, brains, immune systems, kidneys, intestines or livers. Women who were pregnant at the time of the leak gave birth to dead or deformed babies. About 3000 cattles, goats and other animals died.

The tragedy is a burning example of one of the deadliest disaster caused by human negligence in respect of the maintenance. The factory lacked an automatic safety system. The management of the plant believed that a manual safety system was better. The Bhopal Board did not have the instruments needed to measure emissions from the plant. When the Board received the reports that cows had died because of discharge from the plants drainage system, months before the leak, it took no action.

The disaster raised questions worldwide about the suitable places where such factories should be located.

(i) Chemical plants should be located far away from residential areas.

(ii) No residential areas should be located in the down wind direction in respect to it such industries.

Case Study

(i) CHIPKO MOVEMENT

The Chipko Movement is the most well-known people's movement in respect of environmental protection in India. It is a movement of those people who are living in and around the forests that sustain their lives.

The destruction of forests for the survival of the local people through commercial forestry created the Chipko Movement first in the Himalayan area of U.P. Then the movement gradually spread to other mountain-areas such as the Western Ghats, the Aravallis and the Vindhyas.

Villagers have created an effective non-violent way to stop the devastation of forest by the industries. When the axeman comes the people, mainly the women form circles around the trees—they embrace the trees. This have given the movement its name, the tree 'hugging movement', or Chipko Andolan.

The movement was initiated for the protection of forests in India at the end of the year 1960. The main objective of the movement, however, was to ensure survival of the tribal people. Notable among these movements are those of the people of the Singhbhum and the Baster regions. Later on Sundarlal Bahuguna joined in this movement. These movements have sought to convert mixed natural forests into monoculture of commercial species like teak or tropical pine. It is because this process of conversion that leads to the destruction of the material base for the survival of a large proportion of the tribal people. The movement was so intensified that P.M. of India declared that a single tree would not be touched for the next 15 years.

(ii) SILENT VALLEY MOVEMENT

Silent valley is a densely-forested valley that is situated in Palghat district of north Kerala. The name is given as "silent valley" as the forest is very deep, dark and extremely peaceful. The river Kunithpara which is not navigable, is flowing across this valley from North to South.

The state government planned to construct a dam along the slopes of the river. A British technical expert opined that, hydroelectricity could be easily generated from this flowing stream and the Planning Commission approved the proposal.

Later on, in 1976, a task force headed by the vice president of W.W.F. (World Wildlife Fund) in their report advised not to implement the project. They advised that, if the project was implemented then, it would cause ecological disbalance in that region.

The popular sciences organization of Kerala (Kerala Shastra Sahitya Parisad, KSSP) started a movement to stop the project. They went for mass-signature campaign. The resolution of the project was accepted in the aessembly. KSSP wrote a booklet and vehimently opposed this project. They forced the government to postpone the project. Morarji Desai, the then prime minister of India also supported the project along with state government. But many environmentalists like Salim Ali, of IUCN rallied and protested against its implementation.

Ultimately in December, 1980, the Kerala Government announced to reject the project. The Silent Valley was declared as a National Park.

BISHNOI WILDLIFE PROTECTION :

People's movement against felling of trees has a long history in India. In 1731, the King of Jodhpur (Rajasthan) needed wood for construction of his new palace. The king's subjects went to a forest near a village inhabited by Bishnoies, to cut down trees. A Bishnoi women, Amrita Devi showed exemplary courage by hugging a tree to prevent its cutting. Her three daghters and hundreds of other Bishnois follwed her. They were killed by the soldiers so that workers could cut trees. This incident forced the king to abandon the cutting of trees.

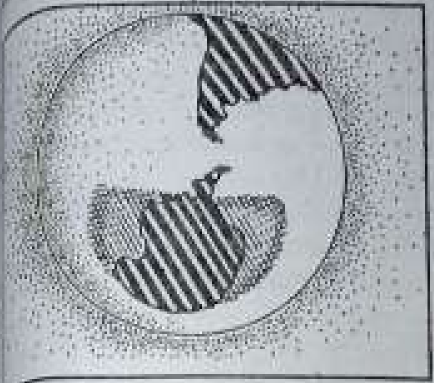
Government of India has recently instituted the Amrita Devi Bishnoi Wildlife Protection Award for individuals or communities from rural areas who have shown extraordinary courage and dedication in protecting wildlife.

APPIKO – CHAVALI MOVEMENT

spired by Chipko Movement of Tehri-Garhwal, tribals from other parts of India sisted tree cutting. In 1983, a similar movement was started in Salkani village in rnataka.

ENVIRONMENTAL ETHICS

'Ethics' is derived from the 'Greek word' Ethos, which means the character of a person scribed by his or her actions. The main theme of environmental ethics is how it is ded by cultural, religious and ethical attitude of man. Ethics is a branch of philosophy ch deals with morals and values. The various issues, principles and guidelines are associated to the human interactions with their environment.



An ethic is a principle or a value that we use to decide whether an action is good or bad. Values change and they differ from country to country.

These are the principles or code of conduct based on moral values for individuals and society especially the professionals as to what should be done and what should not be, keeping in mind, the interest of human being and biosphere as a whole. These are the code of conduct based on moral value for any man o perform any activity or activities and actions which do not harm the ecosystem and ps in protecting the envionment.

Environmental ethics refers to the moral relationships between humans beings and the ural world. It examines the obligations or responsibilities of human beings towards the ural world as well as how these responsibilities balance against human needs and rests.

There are different types of ethics as follows :

1. **Ethics of Conservation :** Ethics of our duty for conserving natural resources and ilize a balance between resource use and resource availability.
2. **Ethics of Development :** It depends on the action and is inevitable.
3. **Ethics of Preservation :** The natural environment gives us a beautiful world, so at we are able to maintain natural enjoyment, meditation, breeding etc. and therefore me rare and endangered species must be preserved. But today several countries are ing a number of environmental problems that threaten human health and growth of osystems. Environmental ethics not only 'emphasise' on environmental protection acts, t also change our daily life. Infact the social system must change to regain a balance in

our life-style. Balance reduces the needs of people. They are encouraged to take me so that used materials get replenished.

Environmentalists suggested the following ethical guidelines for the protection of environment. We have to follow them and moreover we should change our attitude

1. Nature not only exist beings for human but also for all species on the Earth.
2. Man should think to protect all species and to share earth's limited resources.
3. The wasteful use of natural resources leads to its depletion which affects the qu of life of other species.

ROLE OF CULTURE AND GENDER IN ENVIRONMENTAL CONSERVATION :

A. Culture : Sacred Forests and Lakes

Sacred forests (= sacred groves) are forest patches around places of worship which held in high esteem by tribal communities. They are the most undisturbed forest pa (island of pristine forests) which are often surrounded by highly degraded landscapes. T are found in several parts of India e.g., Karnayaka, Maharashtra, Kerala, Meghala Temples built by tribals are found surrounded by deodar forests in Kumaon region, an and Khasias in Meghalaya. Not a single branch is allowed to be cut from these forests a result many endemic species which are rare or have become extinct elsewhere can seen to flourish here. Bishnois of Rajasthan protect *Prosopis cineratia* and Black religiously. Some water bodies are also held sacred in certain places, e.g., Khecho Sikkim. Their aquatic flora and fauna are naturally preserved.

B. GENDER : Women and the environment

In the early 1960s, an interest in women and their connection with the environment sparked, largely by a book written by Esther Boserup entitled Woman's Role in Econo Development. Starting in the 1980s, policy makers and governments became more mi of the connection between the environment and gender issues. Changes began to be ma regarding natural resource and environmental management with the specific role of wo in mind. According to the World Bank in 1991, "Women play an essential role in t management of natural resources, including soil, water, forests and energy...and often ha a profound traditional and contemporary knowledge of the natural world around the Whereas women were previously neglected or ignored, there was increasing attention p to the impact of women on the natural environment and, in return, the effects environment has on the health and well-being of women. The gender-environment relatio have valuable ramifications in regard to the understanding of nature between men a

women, the management and distribution of resources and responsibilities and the day-to-day life and well being of people.

Gender and perception of the environment

Given the environmental degradation caused while men have had dominance over women, and women's large investment in environmental sustainability, some have theorized that women would protect the Earth better than men if in power. Although there is no evidence for this hypothesis, recent movements have shown that women are more sensitive to the earth and its problems. They have created a special value system about environmental issues. People's approaches to environmental issues may depend on their relationship with nature. Both women and nature have been considered as subordinates entities by men throughout history, which conveys a close affiliation between them.

Throughout history men have looked at natural resources as commercial entities or income generating tools, while women have tended to see the environment as a resource supporting their basic needs. As an example, rural Indian women collect the dead branches which are cut by storm for fuel wood to use rather than cutting the live trees. Since African, Asian, and Latin American women use the land to produce food for their family, they acquire the knowledge of the land/soil conditions, water, and other environmental features. Any changes in the environment on these areas, like deforestation, have the most effect on women of that area, und cause them to suffer until they can cope with these changes. One of the good examples would be the Nepali women whose grandmothers had to climb to the mountain to be able to bring in wood and fodder.

An example of female prominence in the defense of natural forests comes from India in 1906. As forest clearing was expanding conflict between loggers arid government and peasant communities increased. To thwart resistance to the forest clearing, the men were diverted from their villages to a fictional payment compensation site and loggers were sent to the forests. The women left in the villages, however, protested by physically hugging themselves to the trees to prevent their being cut down, giving rise to what is now called the Chipko movement, an environmentalist movement initiated by these Indian women (which also is where the term tree-huggers originated). This conflict started because men wanted to cut the trees to use them for industrial purposes while women wanted to keep them since it was their food resource and deforestation was a survival matter for local people.

Gender-based commitments and movements such as feminism have reached to a new approach through the combination of feminism and environmentalism called Ecofeminism. Ecofeminists believe on the interconnection between the domination of women and nature. According to ecofeminism the superior power treats all subordinates the same. So, ecofeminism takes into account women subordination and nature degradation. Remarking all these different reactions, one can see that however, most policy decision makers are men.

FAMILY WELFARE PROGRAMME

The objective of the FWP (Family welfare programme) is to prevent the fertilization of ovum by the male sperm and to stop the increase in population growth by contra captives, intrauterine devices, vasectomy and tubectomy etc.

Ways of Family Planning :

(i) Late marriage. (ii) Divertion of the attention from sex (iii) Avoiding the period of & 18th day from menstrual cycle. (iv) Use of conraceptives. (v) Sterilization (vi) Use of drugs (vii) Abortion (viii) Restriction of the family to three children. -

Population Control by population Education and Mass Media of Communication.

Various methods birth control : Diaphragm, Condom, Jellies, Copper and oral contraceptives.

Sterilization, Vasectomy, Tubectomy, Laproscopy, Medical termination of pregnancy, Abstinence, Coitus interuptus, and '0' zero method etc.

ENVIRONMENT AND HUMAN HEALTH

There is a close relationship between environmental pollution and community health. According to World Health Organisation, health is defined as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"*.

According to the old English term health was a condition of being "hal" that is safe and sound. Health may be defined as *"the state in which the mental and physical activities of the body are adjusted satisfactorily to the environment."*

Society as a whole benefits from people's good health as the society depends upon the healthy people for further progress. With that good view Governments and voluntary agencies strive to preserve and improve the health of all people. The World Health Organization (WHO), works to promote better health throughout the world.

Due to air, water, soil and sound pollutions in the environment the community health respect to is supposed to be disturbed. Several factors are responsible for promoting community health as follows :

(i) Pollution-free soil,
(ii) Safe drinking water,
(iii) Pure air and proper ventilation,
(iv) Safe limit of sound,
(v) Sufficient sun-light,
(vi) Eradication of communicable diseases,

(vii) Minimum nuclear radiation,
(viii) Preservation of health of people working in different fields.
(ix) Removal of garbage and proper disposal of night soil,
(x) Acclimatization with the weather,

Generally infection spreads through air either from inhalation of dust or by droplet infection. The main air-borne diseases produced therefrom are, tuberculosis and pulmonary form of anthrax. Inhalation of particles of dust in various factories may give rise to silicosis, [illegible], anthracosis etc. Small pox, mumps, measles, diphtheria, scarlet fever and some bacterial or virus diseases are also air-borne.

Pathogen	Disease Caused by the Pathogen
Viral diseases	
1. Mumps virus	Mumps
2. Myxovirus influenzae	Influenza
3. Poliomyeltis sp.	Polio
4. Rhinovirus	Common cold
5. Rubella virus	German measles
6. Rubela virus	Measles
7. Varicella virus	Chicken pox
8. Variola pox virus	Small pox
Bacterial diseases	
Bordetella pertusis	Whooping cough
Corynebacterium diphtheriae	Diphtheria
Mycobacterium tuberculosis	Tuberculosis
Diplococcus pneumoniae	Pneumonia
Fungal disease	
1. Aspergillus fumigatus	Aspergillosis
2. Blastomyces dermitidis	Blastomycosis.

Prevention and control of Air-borne diseases

1. Most of the air-borne diseases are infectious (Influenza, Measles, Chicken pox, Whooping Cough, etc.). So, the direct or indirect contact with the patients must be avoided in these cases.

2. Avoid sneezing or coughing without covering the mouth with clothes.

3. Vaccines for tuberculosis, whooping cough, measles, chicken pox, etc., are available as preventive measures.

4. The patient's faeces, vomit, etc., should be received in a disinfectant solution and should be burnt.

5. Food should not be taken together from the same plate.

6. Same toys or articles should not be licked by different children to avoid infections.

7. A high degree of personal and environmental sanitation should be maintained around houses, in streets and hospitals.

Water-borne Diseases :

In polluted water not only many pollutants are present but also many microbes can grow rapidly. Some microbes are pathogene and they cause various diseases.

Viral Diseases : Hepatitis A, B.

Bacterial Diseases : Cholera, Typhoid, Paratyphoid, Bacillary dyssentry.

Protozoal Diseases : Dyssentry, Giardiasis.

Worm Diseases : Hook worm, Round worm, Pin worm.

Different food-items are available in various conditions and stages of preparation. Such food may be frozen, canned or dehydrated. The house flies and other domestic pests like cockroaches etc. carry pathogenic and infective organisms and cause various diseases. They are attracted towards garbage, human faeces and food. The common food-borne diseases are Amoebiosis or Amoebic dyssentry, Diarrhoea etc.

(1) Diseases that are caused by the presence of an infective agent :

(1) Viral : Viral hepatitis, Poliomyelitis, Rota virus diarrhoea in infants.
(ii) Bacterial : Cholera, bacillary dyssentry, typhoid, diarrhoea.
(iii) Protozoal : Amoebiosis, giardiasis.
(iv) Helminthic : Round worm, thread worm, whip worm, hydralic disease.
(v) Leptospiral : Weil's disease.

(2) Diseases that are caused by the presence of an aquatic host :

(i) Cyclops : Guinea worm, fish tape worm.
(ii) Snail : Schistosomiasis.

Prevention and Control of water pollution related to illness :

1. Drinking water is the main source of most of the water-borne diseases. So safe drinking water is necessary for every one. Deep tube-well water is more or less safe.

2. Drinking water should be boiled before use.

3. Chlorine and lime treatment is necessary after 2 months' interval regularly in underground and roof reservoir.

4. We should avoid drinking water in hotels, restaurants, festive occasions and from unknown sources.

5. Water passed through ultra-violet rays is more or less safe.

6. In village, the pond which is selected for drinking water must be barred from washing clothes, utensils and other articles. Moreover weeding and chlorination is necessary at regular intervals. Plastic bags and polythenes should be removed from the pond. It is better that the bank of the pond is cemented in such a way that rainwater and other unwanted articles cannot contaminate the pond water.

7. Addition of chlorine is necessary at regular intervals for drinking well-water.

8. We should avoid contaminated coloured water, cold water, ice, etc., which are sold the road-side.

9. Contaminated Ganga water must be avoided, which is used to prepare special offerings, sweets, flourete (Sinni) etc.

10. Hands should be thoroughly washed a with before eating.

11. Containers of drinking water should be kept covered and away from dust and flies and should be kept at a healthy place.

Water-borne diseases	Name of the Pathogen
Hepatitis or Jaundice	Hepatitis A, B, C Poleomyelitis
Cholera	Vibrio cholerae
Typhoid	Salmonella typhi
Paratyphoid	Salmonella paratyphi
Bacillary dyssentry	Schigella sp.
Dyssentry	Entamoeba histolytica
Giardiasis	Giardia intestinalis

HUMAN RIGHTS

The relation between Man & environment is non-separable. Man is a part of his environment.

Man and environment are synonymous. With progress of time, man has established complete supremacy over nature. The realter in his own ecosystem and society, he established himself. Man is a social creature. By virtue of his education, religion, culture and natural instinct he has made a world of his own. Man has self-respect which gives birth to human rights.

It is not necessary to give a detailed history on the genesis of human rights. In different countries, man started the movement for Human Rights for the last 200 years due to the fact that the devastation of world war, inhuman torture on the weak by the strong, racial indiscrimination, slave system, fanatism of religion etc., forced man to think over to establish Human Rights. The world famous sociologist, **Halcomb** in his famous book, **"Human Rights in the Modern Worlds"** showed that the barbarous activities of the Nazi under leadership of Adolf Hitler throughout the world sowed the seeds of Human Rights. In this context, the Moscow Conference was held in 1943 and Dumberton Oaks Conference was held in 1944.

Establishment of Human Rights in International level protection and security

The United Nations from the very beginning of formation was very much sensitive to this issue. In the UNO Charters, especially 1, 55, 56, 62, 68 and 76 Clauses express reservation of Human Rights and extension of language, colour, sex, religion and independence which were specially stressed. In 1947, the United Nations formed a **"Commission on Human Rights"** and Late Mrs. Franklin D. Roosevelt was the first Chairperson of the Commission.

On 10th December, 1948 in the Annual Meeting of the General Assembly, Universal Declaration of Human Rights draft resolution was accepted. Therefore very year the 10th day of the month of December is observed as the 'Human Rights Day'. In 1968 the 'International Year of Human Rights' was observed.

Aims of Human Rights : Human rights are established basically for the welfare of humans, irrespective of gender man, race, nationality, caste, creed, domestic and international

Vienna Declaration on Environment and Human Rights

In June 1993, 171 countries met in Vienna, the capital of Austria, and discussed some essential clauses : (1) Healthy, natural pollutionless atmospheres are must for every man (2) This which should be improved so that people of the present and future generations should live in a healthy environment.

In every sphere of human activities there are medical treatment, communication, etc., and their good effects should be highlighted to every walk of life. In these ways, we can ensure the Human Rights and protection of the environment.

Environment & Human Rights in Indian Constitution

In the Indian Constitution, the Human Rights have specific mention in Clauses 47, 48A, 226, 300A, 325, 326 and others.

WOMEN AND CHILD WELFARE

Women and children are vital yete they are collectively the weaker section of the society. Women and child welfare is highly necessary for maintaining social welfare. Awareness of every citizen is urgent about the welfare of women and children.

National Women's Commission was set up in 1992 to solve the problems faced by women. In 1993 women's state fund was made to grant loans to energetic women to make them self-supporting. All-round development of children is the foremost task of social upliftment.

In 1992 United Nations Convention in respect to Rights of child was held. Appeal was made for increasing awareness in all walks

related to child education, health, humanity development, giving opinions, making ing assembly having social security. Neglect towards children is still there in human ety. They are still subjected to various exploitation including physical and mental torture. ther problem is child labour which has been emerging as an unfortunate social evil.

For improving the status of women in society of our nation, it is necessary to reduce gender inequality by removing unfair exploitation of female labour. Discrimination based on gender is deeply rooted in every society of our country. Our culture, religion or human nature sometimes play an adverse or antirole about women right.

In practice, women play multiple roles as they are producers, consumers, home managers, mothers and community organisers. The majority of women do not get payment for the work they do as they are not recognised as workers. They are paid less because they are assumed to be supplementary wage-earners ile men are the main bread-earners.

There is maximum exploitation of women in the farm sector. They do a lot of work in sistence farming. But their contribution is not recognised. They are not treated as a mponent of development policy, planning and socio-cultural change.

In fact, technology is geared to the needs of men by way of displacing women and men are mostly involved in low-paid and low-status jobs in our country.

Even today women of the world are subjected to discrimination in respect of freedoms garding voting, marriage, travel, testifying in court, owning property and obtaining custody f children (in case of divorce or separation). The access of most girls and women to ducation, employment, health care and even food is restricted only due ti their gender.

Efforts of our country towards gender equality and gender justice started with the ablishment of the Central Social Welfare Board in 1953. A department of Women nd Child Development was set up in 1985 under the ministry of Human Resource Development.

The gender-gap in literacy, education and health is the most serious factor. Violence gainst women continues to harass the responsible and conscious citizens. The other factor s women's ignorance of legal assistance coupled with the barriers they encounter in getting ccess to legal help and protection.

The 73rd and 74th Constitution Amendment Acts of 1993 constitute a rule for the dvancement of Indian women. It ensures one-third of the total elected seats and positions of chairpersons in rural and urban local elected bodies to women.

In spite of all these, the institutional mechanism for the advancement of women is grossly inadequate. Discrimination against the girl child is more a rule rather than onethe exception. Poverty affects women more adversely. Even today, in our society, women do not participate in decision making works in administration. Women's rights are violeted due to discrimination against on the basis of gender.

Women also need access to better educatation, health care and family planning. The Working Women's Forum helps women to acquire government services for pre-natal and child care, immunisation and family planning. As the income, education and health of the family improve, the number of children who are born drops drastically.

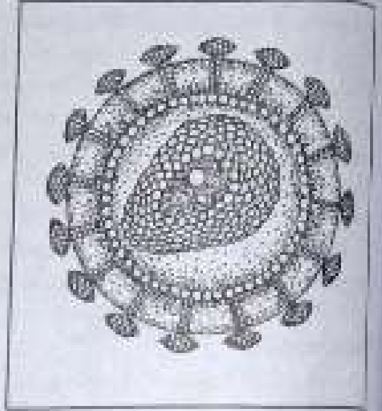
In India women are kidnapped and physically tortured very frequently. Women are killed everyday for dowry but culprits escape safely in most cases. A National Commission for Women was set up in 1991 but it has failed to function as a monitoring body.

One of the biggest barrier for improvement in women's status in developing countries like India is education. Yet another strategy is the process of implementing current laws and policies that are supposed to guarantee girl children their rights. The basic right of a woman is the right to live and marry without being obstructed by socio-economic factors.

HIV (Human Immuno-deficiency Virus)

A modern death warrant is AIDS. The few cases of AIDS were reported first time in USA in 1981.

AIDS or Acquired Immuno-Deficiency Syndrome is caused by a virus called **HIV** or **Human Immuno-deficiency virus.**). HIV is a retrovirus. It is a sphere containing RNA with internal structural protein called P 24. The core proteins cover the internal surface of the envelop.



Today there are about 10 million infected persons who are present in the world, who have the disease themselves or would infect other persons. Highest number of AIDS-infected persons are found in African countries followed by India and other developing countries. An average incidence of AIDS in various categories of persons are—Men-92·5%, Women-6·5% and Children-1%.

- **Symptoms :** First there is an infection which causes immuno-suppression. On the basis of stage of infection AIDS-infected persons are classified into three categories as follows.

(i) Healthy Carriers : This is the first and commonest stage. They have no symptoms of AIDS but they are capable of infecting others. So they are called carriers.

(ii) Prodomal Phase : This group has a milder form of the disease with various symptoms like diarrhoea, fever,,weight loss and enlarged lymph glands. The phase may last for 30 months to 5 years.

(iii) End stage or phase : This stage fully expresses syndrome of AIDS, the immune system completely collapses and it is never regained. The patient may die within four years.

Mode of Transmission : HIV is an infectious viral disease but it is not transmitted

through air, food, water like other viruses. The virus *is present in blood and body fluids of* male and female and may be transmitted to *other male or famale persons. The virus gains* entry into the body through three *major modes, (i) During sexual intercourse with an AIDS*-infected person, the HIV virus may be transmitted *from men to men (homosexual), men* to women (heteroxsexual) and women to men. *(ii) During transfusion of blood or blood* products or through infected blood in needles, syringes etc. (iii) Transmission *from an* AIDS-infected mother to her new-born body.

- **Treatment :** There is no effective curative methods to control *AIDS till now though* some costly medicines are used to extend the life-span.
- **Prevention : Protect yourself from AIDS :**

(i) As the Sexual intercourse is the main made of transmission so the best protection is faithful monogamous relationship.

(ii) Sexual relation outside marriage should be avoided.

(iii) It should be checked that blood is not obtained from professional blood seller.

(iv) One should avoid unknown and unprotected sex.

(v) One should avoid contaminated sharp instruments for shaving; ear piercing etc. in public places.

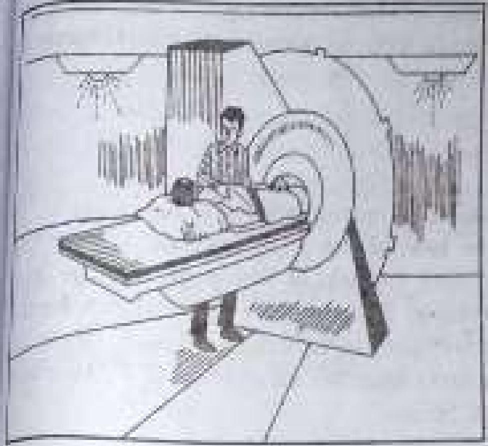
(vi) Only sterile equipments should be used.

ENVIRONMENTAL INFORMATION SYSTEM AND SERVICES

For a long time man has been thinking seriously in respect of the protection of environment and has started a series of movements for its protection. Therefore, there are a good number of institutions and organisations who are working seriously with application of latest devices and technologies for the benefit of the human race alongwith other animals.

Environmental Information

A large number of natural calamities occur in the environments like Earthquakes, Volcanic eruptions, Drought, Flood, Soil erosion, Cyclones, ess. At present with tremendous advancement in science and technology, man can foresee the occurrence of natural calamities well in advance and can take some sort of precautionary measures. T.V., Newspaper, Radio and other media may be utilised for the broadcasting purposes. Anyone sitting in the remotest area of the world can get all such information. Man has set-up Environmental Monitoring Units which are useful to test the different investigations in respect of pollution-aspects of industries and factories. In the modern era everybody is well conversant with the latest developments of the environment.



Information System

People are receiving all sorts of information sitting in rooms due to the well-developed information technology like Computer and E-mail, using the artificial satellite. This modern era is known as the age of Information Technology. From launched satellites, true graphic pictures of land, water, sea, hills, and different aspects of biospheres may be taken. We can take all useful statistics, data and photographs. After scrutinising those documents, the experts can have a fair and sound idea about the environment.

Information Service

Man's civilisation of this modern age has reached the highest peak of development. This has been possible due to proper planning and right thinking about the protection of environment with the idea of sustainable development. So, in every respect, **Environmental Information like Conservation of Biodiversity, Urbanisation, Agricultural Development, Marine fishing** and other important aspects of practical life are necessary for every corner of the world. These systems are absolutely essential for economic development and environmental protection and also for human civilisation.

Environmental Information System in India

Since 1982, Govt. of India turned to be very serious about the Information System on Environment. Throughout India, ENVIS (Environmental information system) is collecting data on science, technology, research, administrative matters, etc., and these are utilized for proper planning. ENVIS is under the Ministry of environment and Forest, Govt. of India, though almost all the States of India have realised the importance of the system and they are also publishing the latest bulletins on these information. This present modern system of ENVIS is now working in close collaboration with the United Nations Development Programme (UNDP). ENVIS has also got recognition of the Regional Service Centre (RSC) which is under the United Nations Economic Programme (UNEP).

Internet

INTERNET is the trijunction of documentation, communication and recreation.

About 50 lakhs of people of India rely on **Internet** for their livelihood and the total income is about 100,000 crores of rupees. With the help of Web-page, writings on it, animation, public relation and many other things are possible It also includes medical transcriptions in respect of examinations by the Physicians, Laboratory Reports, day to day reports of patients etc. In general, the Physicians keep the information in C.D.S.–Tape-records and then send directy to the transcriptionists.

At present any type of information may be given to the Scientists, Sociologists, Business Executives and all others within the quickest possible time to facilitate their work in their own field from any quarter of the world. Therein lies the success of the internet of this modern age.

Nature Study and Need for Public Awareness :

Nature-watch and study is very important for human civilization and progress. Nature means the environment, the natural change of environment means the change which is made by the nature itself. Activities of men also effect the change of the nature. The change may be positive or negative. It is very important to watch and study the change of the nature day by day for taking early precaution and to save the flora and fauna.

Study of the Nature or Envornmental Studies is a multi-disciplinary subject. It is related to physics, chemistry, biology, geography, geology, history, politics, economics, law and sociology.

Environmental Studies is the trigger for environmental literacy. The goal of this branch is to enlighten the public about the environmental challenges we face today. The need for environmental studies can be summarised as follows :

(i) Environmental Studies make people aware of the nature and natural processes and environmental problems.

(ii) It imparts knowledge of philosophy, genesis and consequences of local and global environmental problems, so that people can know about their causes, effects and control.

(iii) It helps in bringing sustainable development and continued economic development.

(iv) Knowledge of environmental studies is a must for conservation of life and biodiversity of our earth.

(v) In our ecosystem environmental problems are of very recent origin. Therefore the knowledge of the subject 'environmental studies' help people to understand the bad effects of any recent environmental problems and to counter these problems.

(vi) It creates an awareness among the people about the importance of scientific utilization and conservation of the resources.

(vii) It provides every person with the opportunities to acquire knowledge, values, skills, attitude and commitment to protect, improve and conserve the environment for the benefit of themselves.

(viii) It examines major environmental issues in National and International level and it creates so a new dimensions of behaviour of individuals and society as a whole towards a better environment.

M.C.Q.

1. **The growth rate of population in India is—**
(a) 3·6% (b) 5·6% (c) 2·1% (d) 3·9%

2. **The human population is growing—**
(a) Geometrically (b) Arithmatically (c) Slowly (d) Moderately

3. **In which country population growth rate is high?**
(a) India (b) Mexico (c) Canada (d) Brazil

4. **Which type of deseases are found maximum in human body?**
(a) Water-borne (b) Air-borne (c) Food-borne (d) Soil-borne

5. **The virus responsible for AIDS—**
(a) HIV (b) Polyomyletic (c) TMV (d) BMV

6. **Universal declaration of Human Rights draft resolution was accepted in the year—**
(a) 1978 (b) 1948 (c) 1940 (d) 1944

7. **In India Women's Commission was set up in the year—**
(a) 1978 (b) 1992 (c) 1998 (d) 2002

8. **In the Indian Constitution, the Human Rights have specific mention in clauses—**
(a) 47 & 48A (b) 20 & 21B (c) 347A (d) 350A

9. **United Nations Conventions in respect of the right of child was made in—**
(a) 1992 (b) 1968 (c) 2002 (d) 2006

10. **'Hepatitis' A is a _____ disease.**
(a) Protozoan (b) Viral (c) Bacterial (d) Fungus

11. **'Salmonella' is responsible for—**
(a) Cholera (b) Dyssentry (c) Typhoid (d) Pox

12. **Infant mortality in developed countries—**
(a) 50 – 100/1000 infants (b) 30-40/1000 infants
(c) 5 – 25/1000 infants (d) 69-75/1000 infants

13. **'Demography' is related to—**
(a) Human population (b) Human health
(c) Human Geography (d) Human ecology

14. **Carrying capacity is directly related to—**
(a) Starvation (b) Population (c) Malnutrition (d) Economy

15. **'Aspergillosis' is a — disease**
(a) Bacterial (b) Viral (c) Fungal (d) Myxoviral

16. **'ENVIS' is related to—**
(a) Water pollution (b) Air pollution (c) Soil polution
(d) Environmental Information System

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17. **UNEP stands for—**
(a) United Nations Economic Programme (b) United Nations Economic Plan
(c) United Nations Economic Progress (d) United Nations Economic Pattern

18. **Vienna Declaration on Human Rights was made in—**
(a) 1990 (b) 1993 (c) 1994 (d) 1995

19. **In developing countries daily food intake in calory per person is—**
(a) 1500 – 2700 (b) 3100 – 3500 (c) 4000 – 4500 (d) 1000 – 1200

20. **At present in India the number of women per 1000 men—**
(a) 212 (b) 887 (c) 927 (d) 721

21. **Minamata disease was found in**
(a) Japan (b) Russia (c) China (d) Korea.

22. **5th June is**
(a) World Forest Day (b) World Red Cross Day
(c) World Environment Day (d) World Food Day.

23. **Melanin protects us from**
(a) X-rays (b) Infra-red rays (c) Visible rays (d) UV rays.

24. **Which is most ionising**
(a) X-rays (b) γ-rays (c) β-rays (d) α-rays.

25. **Thermal pollution results in**
(a) Depletion of oxygen (b) Increase in temperature of water bodies
(c) Death of aquatic animals (d) All the above.

26. **Which can be used for cleaning water body**
(a) Chlorella (b) Eichhornia (c) Cyanobacteria (d) Chlamydomonas

27. **Pollutant emitted by paddy fields is**
(a) CO_2 (b) CH_4 (c) CO (d) H_2O_2

28. **Methyl isocyanate of Bhopal gas tragedy was**
(a) Carbamate (b) Organophosphate
(c) Organochlorine (d) None of the above.

29. **World Environment Day is celebrated on**
(a) 25th Dec (b) 20th September (c) 5th June (d) 9th July.

30. **SO_2 pollution affects**
(a) Mitochondria (b) Chloroplasts (c) Golgi bodies (d) Vacuoles.

31. **Primary constituents of photochemical smog are**
(a) SO_2 and CO (b) CO_2 and NO_2
(c) NO_2 and hydrocarbons (d) Hydrocarbons and CFCs.

32. **BOD is a measure of**
(a) Industrial waste being poured in body
(b) Extent of pollution with organic compounds
(c) CO combined with haemoglobin (d) O_2 required by green plants during night.

33. Drinking mineral water/aerated drink with low levels (~ 0·02 ppm) of pesticide for long period would
(a) Cause cancer of intestine (b) Pesticide accumulation in the body
(c) Cause leukaemia (d) Produce immunity against mosquitoes

34. In Indian metropolitan cities like Delhi major air pollutant is
(a) SPM (b) SO$_x$ (c) NO$_x$ (d) CO and CO$_2$

35. Photochemical smog consists of
(a) O$_3$, SO$_x$, and hydrocarbons (b) O$_3$, PAN and NO$_x$
(c) SO$_2$, CO$_2$ and hydrocarbons (d) SO$_2$, PAN and smoke.

36. Given below are assertion and reason. Point out if (a) both are true with the reason being the correct explanation (b) both are true but the reason is not the correct explanation (c) the assertion is true but the reason is wrong (d) both are wrong.
Assertion. Inhabitants close to busy airports are likely to experience health hazards.
Reason. Sound levels of jet aeroplane usually exceed 160 dB
(a) (b) (c) (d)

37. Fluoride pollution mainly affects
(a) Brain (b) Heart (c) Teeth (d) Kidney

38. Acid rain is caused by
(a) SO$_2$ (b) NO$_2$ (c) CO (d) Both a and b

39. Entry of sewage in water caused a spurt in the growth of algae but kills fish due to
(a) Decrease in nutrients (b) Reduction in light
(c) Depletion of oxygen (d)*All the above.

40. Chlorofluorocarbons are not being used in refrigerators because they
(a) Increase temperature (b) Cause allergic reactions
(c) Deplete ozone (d) Both a and b.

41. Third generation pesticides are
(a) Pheromones (b) Juvenile hormone analogues
(c) Insect repellents (d) Pathogens.

42. Ozone hole causes
(a) Global warming (b) Reduction in the rate of photosynthesis
(c) More ultraviolet rays come to earth (d) All the above.

43. Role of CFC present in atmosphere is to
(a) Reduction in ozone (b) Ozone formation
(c) Formation of haemoglobin (d) Enhance chlorophyll formation

44. Concentration of DDT from lower to higher trophic level
(a) Increases (b) Decreases (c) Increases or decreases
(d) Remains constant.

45. Noise becomes uncomfortable above
(a) 180 dB (b) 140 dB (c) 100 dB (d) 80 dB.

46. DDT is
(a) Organophosphate (b) Organochlorine (c) Carbamate (d) Triazine.

47. Which pesticide is a herbicide
(a) Malathion (b) Lindane (c) BHC (d) 2, 4—D.

48. Allethrin is
(a) Fertilizer (b) Herbicide (c) Growth hormone (d) Insecticide.

49. The process of conversion of harmful industrial wastes into less toxic or nontoxic form by micro-organisms is
(a) Bioconversion (b) Precipitation
(c) Bioremediation (d) Complement fixation.

50. 70 — 90 dB sound is
(a) Quiet (b) Very loud (c) Uncomfortable (d) Painful.

51. Occurrence of water blooms in a lake indicates
(a) Excessive nutrient availablity (b) Nutrient deficiency
(c) Oxygen deficiency (d) Absence of herbivores.

52. The first biosphere reserve to be established in India was
(a) Nanda Devi (b) Nilgiri (c) Great Nicobar (d) Thar.

53. Soil pollutants affecting food-chains and food-webs by killing micro-organisms are
(a) Chemical fertilizers (b) Agriculture wastes (c) Pesticides (d) Pathogens

54. NEERI is at
(a) New Delhi (b) Nagpur (c) Kolkata (d) Chennai.

55. Minimata disease is caused by
(a) Chromium (b) Cadmium (c) Methyl mercury (d) Radioactive elements.

56. In acid rain, SO$_2$, sulphuric acid accounts for
(a) 100 % (b) 30 % (c) 50 % (d) 70 %

57. Maximum permissible noise as per Noise Pollution Rules 2000 is
(a) 75 dB (b) 65 dB (c) 55 dB (d) 45 dB.

58. Chlorofluorocarbons are responsible for
(a) Acid rain (b) Ozone layer depletion
(c) Global warming (d) Thermal inversion.

59. Chernobyl nuclear tragedy occurred in
(a) April 1986 (b) August 6, 1945
(c) August 9, 1945 (d) December 3, 1984.

60. Insecticides usually act upon
(a) Muscular system (b) Digestive system
(c) Nervous system (d) Circulatory system.

61. Which one is correct

(a) Herbicides kill plants by blocking PS II

(b) Insecticides kill insects through impairment of nerve conduction and sometimes respiratory arrest

(c) Both a and b (d) None of the above.

62. An air pollutant which can cause acid rain and which is injurious to respiratory tissue is

(a) Nitric acid (b) Sulphur dioxide (c) Lead nitrate (d) Carbon dioxide

63. Use of pesticides is problematic as

(a) Their residues persist in water and environment

(b) Mosquitoes have become resistant to DDT

(c) Kill silkworms (d) Deform gills of some fishes

64. A hyper metal accumulator is

(a) *Daucos carota* (b) *Nicotiana tabacum*

(c) *Arabidopsis* (d) *Thlaspi goesingensis.*

65. Rain is called acid rain when its pH is below

(a) 7 (b) 6·5 (c) 6 (d) 5·6

66. Bhopal tragedy occurred in

(a) 1982 (b) 1984 (c) 1986 (d) 1988.

67. Bhopal gas tragedy of 1984 took place because methyl isocyanate reacted with

(a) DDT (b) Ammonia (c) CO_2 (d) Water.

68. Lead concentration of blood is considered alarming at

(a) 4 – 6 µg/100 ml (b) 10 µg/100 ml (c) 20 µg/100 ml (d) 30µg/100 ml

69. Biomagnification refers to

(a) Rapid growth due to excessive intake of nutrients

(b) Increase in population size (c) Decrease in population size

(d) Increase in concentration of nondegradable pollutants as they pass through food chain.

70. Nitrogen oxides formed during emission from automobiles and power plants are a source of fine air particles which lead to

(a) Dry acid deposition (b) Photochemical smog

(c) Wet acid deposition (d) Industrial smog.

71. A lake receiving domestic sewage shows

(a) Drying up due to algal bloom

(b) Increased fish production due to higher nutrient availability

(c) Death of fish due to oxygen depletion

(d) Increased food-web organisation.

Given below are assertions and reasons. Point out if (a) both are true with reason being true explanation (b), both are true but reason is not correct explanation (c), assertion is true but reason is wrong (d), and both are wrong.

72. **Assertion :** Agriculture output increased several times after the introduction of DDT.
Reason. DDT was the first insecticide used on a wide scale.

(a) (b) (c) (d)

73. **Assertion :** Methane component of green house gases contributing to global warming is about 20%.

Reason. Introduction of multipoint fuel injection engines in automobiles has decreased methane content in exhausts

(a) (b) (c) (d)

74. **Assertion :** Suspended particulate matter (SPM) is an important pollutant released by diesel vehicles.

Reason : Catalytic converters greatly reduce pollution caused by automobiles.

(a) (b) (c) (d)

75. **Assertion :** Presently the global atmosphere is warming up

Reason : The depletion of stratospheric ozone layer has resulted in increase in ultra-violet radiations reaching earth.

(a) (b) (c) (d).

76. **Environmental Protection Act was passed in**

(a)1986 (b)1981 (c) 1974 (d) 1968.

77. **Black lungs disease is common in**

(a) Farmers (b) Workers of petrochemical industry

(c) Coal mines (d) Refinery workers.

78. **CO_2, CH_4, N_2O, CFCs are called green house gases because they can absorb**

(a) Ultra-violet radiations (b) Long wave infra-red radiations

(c) Visible light radiation (d) X-ray radiation

79. **Which is correctly matched?**

1. Arsenic poisoning-Black foot disease. 2. Secondary Effluent treatment —Biological process. 3. Pyrolysis — Solid soil waste disposal. 4. Tubifex—Water pollution indicator. 5. Biomagnification —Degradable pollutants.

(a) 1, 2, 3, 5 (b) 1, 3, 4, 5 (c) 2, 3, 4, 5 (d) 1, 2, 3, 4

80. **Green house effect is the cumulative result of the influences of certain gases. Indentify the gas which is not involved in this influence.**

(a) Methane (b) Carbon dioxide (c) Chlorofluorocarbons

(d) Nitrogen.

81. Match the columns and find out the correct combination

I		II	
a	DDT	i	CO, CO_2
b	PAN	ii	Smog
c	Acid rain	iii	Biological magnification
d	Global warming	iv	SO_2

(a) a — iv, b — iii, c—ii, d—i
(b) a—i, b — iii, c-ii, d—iv
(c) a — ii, b — iiii, c—iv, d—i
(d) a —iii, b — ii, c — iv, d—i

82. Which one of the following is mismatched?
(a) Fossil-fuel burning—Release of CO_2 (b) Nuclear power—Radioactive wa
(c) Solar energy —Green house effect (d) Biomass burning—Release of CO_2

83. Identify the correctly matched pair
(a) Basal Convention — Biodiversity Conservation
(b) Kyoto Protocol — Climate change
(c) Montreal Protocol —Global warming
(d) Ramsar Convention —Groundwater pollution.

84. Which one of the following is not used for disinfection of drinking wate?
(a) Chlorine (b) Ozone (c) Chloramine (d) Phenyl

85. Which one of the following statements pertaining to pollutant is corre?
(a) DDT is a nonbiodegradable pollutant
(b) Excess fluoride in drinking water causes osteoporosis
(c) Excess cadmium in drinking water may cause black foot disease
(d) Methyl mercury in water may cause "itai itai" disease.

86. Formation of nonfunctional methaemoglobin causes Blue-baby syndrom, This is due to
(a) Excess of arsenic in drinking water (b) Excess of nitrate in drinking wa
(c) Deficiency of iron in food
(d) Increased methane content in atmosphere.

87. A mutagenic pollutant is
(a) Organophosphates (b) Resins (c) Hydrocarbons (d) Nitrogen oxides.

88. Excess atmospheric CO_2 increases green house effect as CO_2
(a) Is opaque to infra-red rays (b) Is not opaque to infra-red ray
(c) Precipitates dust in the atmosphere (d) Reduces atmospheric pressu

89. Limit of BOD prescribed by Central Pollution Control Board for dischar of industrial and municipal waste waters into natural surface waters i
(a) < 3·0 ppm (b) < 10 ppm (c) < 30 ppm (d) < 100 pp

90. **Montreal Protocol which calls for appropriate action to protect the ozone layer from human activities was passed in the year**
(a) 1985 (b) 1986 (c) 1987 (d) 1988.

91. **Blue-baby syndrome results from**
(a) Excess of TDS (b) Excess of chlorides
(c) Excess of dissolved oxygen (d) Methaemoglobin.

92. **Photochemical smog does not contain**
(a) PAN (b) Ozone (c) Nitrogen dioxide (d) CO_2

93. **A nonbiodegradable pollutant is**
(a) Newsprint (b) Green leaves (c) DDT (d) Cowdung

Given below are assertions and reasons. Point out if (a) both are true with reason being correct explanation (b), both true but reason is not correct explanation (c), assertion true but reason is wrong (d), both are wrong.

94. **Assertion. Deforestation is one of the main factors contributing to global warming**
Reason. Besides CO_2, two other gases, methane and CFCs, are also included under green house gases.
(a) (b) (c) (d)

95. **Assertion. UV radiation causes photodissociation of ozone into O_2 and O thus causing damage to stratospheric ozone layer.**
Reason. Ozone hole is resulting in global warming and climatic change.
(a) (b) (c) (d).

96. **Assertion. Concentration of methane in the atmosphere has more than doubled in the last 250 years.**
Reason. Wetlands and rice fields are the major source of methane
(a) (b) (c) (d)

97. **Which one of the following is an environment-related disorder with correct main cause**
(a) Black lungs disease is found mainly in workers of stone quarries and crushers
(b) Blue-baby disease is due to heavy use of nitrogenous fertilizers
(c) Non-Hodgkin's lymphoma is found mainly in workers involved in manufacture of neem-based pesticides
(d) Skin cancer occurs mainly in people exposed to benzene and methane.

98. **Montreal Protocol refers to**
(a) Substances that deplete ozone layer (b) Persistent organic pollutants
(c) Global warming and climate change
(d) Biosafety of genetically modified organisms.

99. Match the columns

I		II	
a	Arsenic	i.	Minamata disease
b	Nitrate	ii	Itai-itai
c	Mercury	iii	Blue-baby syndrome
d	Cadmium	iv	Skeletal fluorosis
e	Fluoride	v	Black foot disease

(a) (a) – (5), (b) – (3), (c) – (1), (d)– (2), (e) – (4)
(b) (a)-(2), (b)-(3), (c)-(5), (d) (1), (e) (4)
(c) (a)-(3), (b)-(4), (c)-(5), (d)-(1), (e)-(2)
(d) (a)-(5), (b)-(4), (c)-(3), (d)-(2), (e)-(1)
(e) (a)-(2) (b)-(5), (c)-(4), (d)-(3), (e)-(1)

100. Which one of the following will not control particulate pollutants
(a) Incinerator (b) Arrester (c) Scrubber (d) Filter
(d) Electrostatic Precipitator.

101. Which is not the proper strategy to reduce global warming
(a) Developing substitutes of chlorofluorocarbons
(b) Increasing use of air conditioners, refrigeration units and production of plastic foams and propellants in aerosol spray-cans
(c) Minimising use of nitrogen fertilizers in agriculture for reducing nitrogen oxide emission
(d) Increase vegetation cover, particularly forest, for photosynthetic utilisation of CO_2
(e) Reducing green house gas emission by limiting use of fossil-fuels.

102. Act formulated in 1986
(a) The Insecticide Act (b) The Environmental (Protection) Act
(c) The Water (Prevention and Control of Pollution) Act
(d) The Air (Prevention and Control of Pollution) Act
(e) The Noise (Prevention and Control of Pollution) Act.

103. Increase in concentration of pollutants at higher trophic levels is called
(a) Recycling (b) Eutrophication (c) Biodegradation (d) Biomagnification.

104. High amount of Esherichia coli in water is an indicator of
(a) Hardness of water (b) Industrial pollution
(c) Sewage pollution (d) Presence of chlorine in water.

105. Find out the incorrect statement in relation to pollution
(a) Plastic is a nondegradable pollutant
(b) Water vapours, smoke fumes and dust mixture form smog
(c) PAN affects photosynthesis
(d) Ozone layer forms protective shield to ionosphere.

106. **Eutrophication of water bodies leading to killing of fishes is *mainly due to***
(a) Nonavailability of oxygen (b) Nonavailability of Light
(c) Nonavailability of food (d) Nonavailability of *essential minerals*

107. **Process by which insecticides like DDT reach man is**
(a) Bioaccumulation (b) Biomagnification (c) Bioremediation
(d) Eutrophication.

108. **Effect of pollution is observed first on**
(A) Food crops (b) Green vegetation (c) Micro-organisms (d) *Herbivores*

ANSWER

1. (c) 2. (a) 3. (b) 4. (a) 5. (a) 6. (b) 7. (b) 8. (a) 9. (a) 10. (b) 11. (c) 12. (c)
13. (a) 14. (b) 15. (c) 16. (d) 17. (a) 18. (b) 19. (a) 20. (c) 21. (a) 22. (c) 23. (d)
24. (d) 25. (d) 26. (b) 27. (b) 28. (a) 29. (c) 30. (b) 31. (c) 32. (b) 33. (b) 34. (a)
35. (b) 36. (c) 37. (c) 38. (d) 39. (c) 40. (c) 41. (b) 42. (c) 43. (a) 44. (a) 45. (d)
46. (b) 47. (d) 48. (d) 49. (c) 50. (b) 51. (a) 52. (b) 53. (c) 54. (b) 55. (c) 56. (d)
57. (a) 58. (b) 59. (a) 60. (c) 61. (c) 62. (b) 63. (a) 64. (c) 65. (c) 66. (b) 67. (d)
68. (d) 69. (d) 70. (b) 71. (c) 72. (a) 73. (b) 74. (b) 75. (b) 76. (d) 77. (a) 78. (c)
79. (b) 80. (d) 81. (d) 82. (d) 83. (c) 84. (b) 85. (d) 86. (a) 87. (b) 88. (c) 89. (a)
90. (c) 91. (c) 92. (d) 93. (d) 94. (c) 95. (b) 96. (d) 97. (b) 98. (b) 99. (a) 100. (a) 101.
(a) 102. (b) 103. (b) 104. (d) 105. (c) 106. (d) 107. (a) 108. (b) 109. (c)

Fill up the blanks :-

Q.1. Population density =——.
Ans. Total population per km. area.

Q.2. Life on the earth surface have originated during ___ era while human came during ___ era.
Ans. Archean, cenozoic.

Q.3. Over population means the population above —— population.
Ans. Optimum.

Q.4. The population below optimum population is —— population.
Ans. Under.

Q.5. —— and —— are two important water borne diseases.
Ans. Typhoid, Cholera.

Q.6. The population cannot be isolated by —— barriers.
Ans. Geographical.

Q.7. Normal proportion of forest area of a country should be ____.
Ans. 1 : 3 (33%)

Q.8. Increase of population creates —— impact on the environment.
Ans. bad.

Q.9. Greening ——— environment degradation.

Ans. Prevents

Q.10. Earth quake disaster recently occurred in the state of ——— India.

Ans. Gujarat

Q.11. India passed the Human rights Act in ———

Ans. 1993.

Q.12. Seismograph is related to ———.

Ans. earthquake.

Q.13. Storms of West Indies is known as ———.

Ans. Hurricans

Q.14. Typhoon is a storm found in ———.

Ans. China Seas.

Q.15. Storms of Australia is known as ———.

Ans. Willy Willies.

Q.16. ——— is releted to Minamata Disease.

Ans. Mercury.

Q.17. Chernobyl is well known for ———.

Ans. Nuclear Accident.

Q.18. UNDP means ———.

Ans. United Nations Development Programme.

Very Short Answer type Questions

Q.1. When was earth summit held ?

Ans. In 1992 (3rd to 14th June) at Rio-de-Jeaerio (Brazil).

Q.2. When did super cyclone occur in orissa ?

Ans. In 1999 (More than 10,000 people died and huge property destroyed)

Q.3. What is the meaning of environment under the environment (Protection) Act?

Ans. Environment means the interrelationship which exists among and between air, water and land, and human beings, other living organisms plants, micro-organisms and property.

Q.4. What is the rate of change of temparature in troposphere per kilometer rise in height ?

Ans. Temparature decreased at the rate of 6.4°C per Kilometer.

Q.5. In which scale is the intensity of erath quake measured ?

Ans. Richter scale.

Q.6. What is cyclone ?

Ans. A Type of parlrculate Collector which depends upon centrifugal force for its action. The low pressure zone pulls warm air from the surroundings and may ultimately develop to form a spiral weather system. This is known as cyclone.

Q.7. Mention two environmental Movements.

Ans. Chipco Movement (Uttarakhand, U.P), Silent valley Movement (kerala)

Q.8. Mention a few conventional sources of energy.

Ans. Coal, petroleum (Fossil Fuel), atonic energy, Natural gas.

Q.9. What is the safe limit of radiation exposure for a common man.

Ans. 10-15 Roenf gen (Rem)

Q.10. Which state of India has secured highest position in human development?

Ans. Kerala,

Q.11. In Which year Environment protection Act came into existence ?

Ans. 1986 (on 26th may)

Q.12. What are the socio-economic consequences of Environmental problems.

Ans. Education, Health, Scocial stability, pure water. Pure air, agriculture, income, industry, irrigation will be badly affected due to the environmental problems.

Q.13. What is shifting cultivation ?

Ans. It is a migratory primitive subsistance agriculture The cultivation is shifted from old place to a i-.e.w place after every 3-4 years, this type cultivation is found in hilly rations.

Q.14. Write the meaning of green revolution ?

Ans. The scientific process of food production which had been started since 1966—67 by using high yielding seeds, manures, pesticides etc is known as green revolution.

Q.15. 'What do you mean by 'Ozone hole' ?

Ans. Presence of 'ozone hole' was first invented by Dr. Jo Foreman, 1982. CFC and oxides of nitrogen are responsible for 'Ozone hole'. Main factors of ozone depletion are CFCS wrich transfomed in molecules gas and in presence of ice crystal breaks into chlorine molecules, chlorine atom destroys at least ten thousand atom molecules. In this way a hole ocurrs in ozone layer is known as "ozone hole"

Q.16. What is green accounting?

Ans. The statistics or accounts regarding value and significance of any subject related to environment is known as green accounts.

Q.17. Why Use of plastic bags should be controlled/banned ?

Ans. Plastic is a non-degradable polymer. Plastics are harmful substances which have a remarkable degree of resistance to the natural agencies of decay and decomposition and persist in the environment for a long duration of time. Plastic bags creal problem in sewerage, choke the soil and disturb ground water system. (Ref. page 99 Q. 201). The plastic with low thickness less than 20 micron are dangerous for environment. Burning of plastics creats air-pollution. Recycling of pbstic is defficult. For these reasons plastic bags should be banne on controlled.

Short Type Question Answer

Q.1. What is 'Green Bench' ? What do you mean by 'Green-belt'.

Ans. 'Gteen Bench' is the part of the Judicious system made by the Hon'ble High court of each state for the protection of environment. 33% are;', the industrial belt or surrounding a town should be covered by forest (According to Environment Protection act). This green are? within the polluted belt or surrounding a town is known as green belt. That is planned and designed for the purpose of restricting indiscriminate outward extension of the urban area, industry and fanning down the level of pollution.

Q.2. What is land degradation?

Ans. Excessive grazing of animals, cultivation, deforestation, flowing of river, rain water and high velocity of wind are the causes which make the soil weak and reander the soil erodable. This process is known as land degradation.

Q.3. What is Agenda-21 ?

Ans. In the Earth Summit at Rio de Janeiro in 1992, 130 countries discussed on 21 agenda regarding environmental problems including desertifications, deforestations and global worming. These are known as 'Aiienda-21"

Q.4. What do you mean by "Composting" ?

Ans. Composting of refuses (kitchen wastes, leaves and grasses) is an aerobic method of decomposing solid waste. Many types of microorganisms stabilize the organic matter of the waste to produce a soil conditioner. Modern Methods of composting fall into two broad catagories—(1) Manual window system, (2) Ban'galore Process (Mechanical).

Q.5. What do you mean by Exponential population growth' ?

Ans. Growth of population in geometrical progression in a density independant factor is known as exponential population of growth. I - r N (I = Expected increase, r = rate of increase, N = Current population). Incase of Exponential population growth 'N' is always high.

Q.6. What is wasteland ?

Ans. The uncultivated land which is not capable of Producing agricultural meterials or rendering service of value is known as wastelands.

Q.7. What is chipko movement ?

Ans. 'Chipko' means to 'hug' or 'cling to'. This is an environmental movement carried out by the local tribal people in Uttarakhand of U. P. for forest conservation. In this movement local tribal women encircled the trees refusing the loggers of the contractors to cut the trees. This had to be done because all non violent persuasive and legal actions had failed to protect the trees. The movement was started at the end of the year of 1960 and it was so intensified that prime minister of India finally declared that not a single tree in the region would be touched for the next 15 years.

Q.8. What is environmental ethics ?

Ans. Ethics, a branch of philosophy deals with moral and values. Environmental Policies or acts are not sufficient for Environmental conservation. Public education and awareness among the people about the need of conservation is needed for better result. Therefore 'Environmental Ethics' refers to the moral relationship between human beings and the natural environment. It exerts influence on various disciplines (sociology, economics, geography etc.) An Environmental ethic is a principle or a value that are use to decide whether an action is good or bad for environment.

Q.9. What is CITES ?

Ans. CITES - Convention on International Trade in Endangered Species. It is an international forum for conservation of wildlife including endangered speices. India is a member of this forum.

Q.10. What is bio concentration factor ?

Ans. BCF or bioconcentration factor is the quantitative description of a chemical in an living organism (fish) from water uptake alone.

Chemical concentration in tissue of fish BCF =
Chemical concentration in water

Q.11. What is bio-prospecting ?

Ans. 'Bioprospecting' means discovery, Protection and use of important Biological resources assessing their prospects in agriculture and pharmaceutical industries.

Q.12. What is biotic Potential ?

Ans. The maximum reproductive rate or the maximum skill of reproduction of an organism or a population at stable optimal environmental condition is called its biotic potential.

Q.13. What is meant by population growth ?

Ans. The characteristic increase in the number of offsprings or individuals of a population is called population growth. Two basic form of growths are J-shaped and S-shaped growth form.

Q.14. What is Lake Bloom ?

Ans. The excessive growth of aquatic vegetation due to presence of organic sewage and reduction of dissolved oxygen Concentration in water is called 'Lake Bloom'.

Q.15. What is agent orange ?

Ans. Agent Orange is a herbicide (a mixture of 2-4-D and 2-4-5-T) used for forestry control. This herbicide acts defoliants and heavily used during Vietnam war.

Q.16. What is I.T.C.Z. ?

Ans. I.T.C.Z. stands for Inter Tropical Convergence zone. North-east trade winds and south-east trade winds meet at this zone and form a belt of calm region.

Q.17. What is e-waste Electronic waste ?

Ans. The residual portion or non-used matter of a substance which emerges from its utilisation From electronic industries is called e-waste.

Q.18. State causes of landslide.

Ans. (i) Deforestation.
(ii) Faulty agricultural practices.
(iii) Overgrazing.
(iv) hydroelectric power projects.
(v) Road construction.
(vi) Lack of proper draining facilities.

Read the following passages and darken the circle/circles corresponding to the correct statement.

Passage 1

Women and female children do much of the gathering and fetching from forests. Women also have fewer earning opportunities, enjoy lesser job search mobility and typically receive lower pay for the same and similar work.

Women's unequal access to knowledge systems and decision-making authority at all levels lower them to a great extent.

As a result, it has adverse effect on time, income, nutrition, health, social support networks and indigenous knowledge. In many regions, peasant women are responsible for indigenous seed-selection and preservation. With the large scale shift to hybrid seed varieties, control has passed unto the national and international laboratories. While traditional knowledge system is being devalued, the women, who possess this knowledge and depend on it, have little access to the institutions which create what is considered as scientific knowledge and modern technology.

In this sense, what we see today is not a crisis for sustenance of the poor and for women, it is also the loss of knowledge which is critical for generating a sustainable livelihood system.

Statement 1 :	Peasant women are responsible for indigenous seed-selection and preservation.
Statement 2 :	In India women have fewer earning opportunities.
Statement 3 :	Women and female children receive same pay for the same and similar work.

Ans.	●	●	○
	1	2	3

Passage 2

To cope up with the state of present environment, long-term sustainable development should be planned meticulously. The main theme of the topic should be to improve the socio-economic status of man by wiping out famine, unemployment vis-a-vis introduction of education, health schemes for all, etc.

For the protection of natural resources and for the improvement of socio-economic condition, meticulous and effective planning is necessary. One point must be kept in mind, for launching projects, environment must not be disturbed under any circumstances.

In 1972, in Stockholm in Sweden, a Summit Conference on Environment was held. In 1980, an exhaustive report on 'World Conservation Strategy' was published by International Union of Conservation of Nature (IUCN) in which 'Sustainable Development' was emphasized, and in 1992 in Rio-de-Jenaraio of Brazil another World Conference (Basundhara Conference) was held which adopted the 'Agenda 21' for sustainable development of the world.

Statement 1 :	Sustainable development is not suitable for the socio-economic condition.
Statement 2 :	Basundhara Conference was held in 1992
Statement 3 :	World Conservation Strategy was published by IUCN

Ans.	○	●	●
	1	2	3

Unit 8

Field Work

8.1. What is a Project ?

Project is a investigatory work to test the validities of the theoritical idea of any subje To develop the concept of original thinking, planning and performing the idea a proje work is essential.

Guidelines for Project Work

(i) Selection of topic,
(ii) Planning of the project,
(iii) Procedure,
(iv) Observations
(v) Conclusion

Project is a type of experimental exercise performed with a practical attitude.

Project work should be written in the following sequences :

(i) Title of the Project
(ii) Aim of the Project
(iii) Introduction
(iv) Requirements
(v) Procedure
(vi) Observation
(vii) Collection of Data
(viii) Conclusion
(ix) Reference
(x) Acknowledgement.

PROJECT–1

TITLE :
Visit to a local area to
document environmental assets
(River/Forest/Grassland/Hill/Mountain)

✧ **Aim of the Project :** To study the environmental assets of an area and to know about the relationship of the assets with the local people.

✧ **Introduction :** The Environment is the sum-total of living and non-living things which exert influence on the living organisms which are present at a particular area. Life is solely and wholly dependent on environmental assets. An area may have various types of ecosystem i.e., pond, marshy land, agricultural land, forest, grassland and so on.

✧ **Preparation :** A few groups of students (not more than 20 in each group) were made to observe the environmental assets and to prepare a document on various components, bio-diversity and natural resources available in the area with the guidances of teachers on a day in the week.

✧ **Requirements :** Notebook, Pen, Pencil, Eraser, Hand lens, etc.

✧ **Procedure :** A place was selected nearer to our college for the project work. We took help from the local people to locate various environmental resources. All the informations were noted in a note book.

Place ____________________ Block ____________________

Sub-Division ______________ District ____________________

J. L. No. of the area ____________________

The area was identified from geographical point of view and the area was divided into several parts in accordance with the location of natural resources.

We prepared a hand-sketch Map of the area :

Data on the basis of observation :

(a) Total area : About 25 Hecter.
(b) Forest area : About 3 Hecter
(c) Social forestry area : About 1½ Hecter
(d) River and water bodies : 6 Hecter
(e) Agricultural land : 9 Hecter
(f) Fallow land & grassland : 1½ Hecter
(g) Garden : 1½ Hecter
(h) Residential area : 3½ Hecter

◆ **Description :**

◆ **Forest Area** : It is not a dense forest. Some shrubs and trees are found in th forests. A few herbaceous plant are also found in the area.

Products collected by the local people :

(i) Wood for household use.

(ii) Fruits, leaves are sold in the local market.

(iii) Roots, nuts, fuel wood, timber, grass, honey, fiber, cane, jum, resins, medicin products are the valuable forest products.

Cattle tracks, cow-dung piles indicate the grazing of domestic animals. People cut th branches of the trees and shrubs for fuel-wood.

Larger stumps of tree trunks indicate that the trees have been sold as timber.

A Forest Ecosystem

(a) Abiotic Components

The abiotic components of the forest are both organic and inorganic compounds. Thes are water, carbon-dioxide, oxygen, nitrogen, calcium, phosphorus, amino acid, hum acids, carbohydrates, protein and fat. Light, temperature, humidity, rainfall, dead orga debris–the litter accumulation is a very common feature.

(b) Biotic components

The living organisms present in the food-chain occur in the following order :

1. Producers : The producers are mainly trees, shrubs and herbs and grasses. Th foliage of the tall trees forms the top storey, the shrubs form the middle storey and th herbs form the bottom storey besides the ground vegetation. The important produc trees are sal (*Shorea robusta*), teak (*Tectona grandis*), mango (*Mangifera indica*) etc. Shrub are represented by species of *Bauhinia, Diospyros, Zizyphus* etc. Numerous epiphyt and lianas are also found in forests as producers.

---

2. **Consumers** : These are as follows—

(a) **Primary consumers** : These are the herbivorous animals feeding on tree leaves ants, flies, beetles, leaf-thoppers, spiders, etc., and larger animals grazing on shoots fruits of the producers are moles, squirrels, bats, monkeys, etc.

(b) **Secondary consumers** : The carnivorous animals like snakes, birds, lizards, feeding on the harbivores are considered as the secondary consumers.

(c) **Tertiary Consumers** : The top carnivores like lion, tiger etc. are the tertiary sumers.

3. **Decomposers** : A wide variety of micro-organisms including different species of are the decomposers. Fungi are species of Aspergillus, Coprinus, Fusarium etc. teria are represented by species of Bacillus, Clostridium, and actinomycets are species Streptomycenes, etc.

GRASSLAND ECOSYSTEM

A distribution of rainfall from 25 of 75 cm per year, temperature from 5° to 25°C ms temperate grasslands.

(a) **Abiotic Components**

The chief substances are temperature, light, moisture and the inorganic and organic compounds, such as water, carbon dioxide, oxygen, calcium, nitrogen, phosphates, amino ids, humic acid, etc., which are present in the soil and the aerial environment.

(b) **Biotic Components**

The biotic components of a grassland ecosystem are of the following orders :

1. **Plants** : They consist of large number of annuals, the grasses which are from 2 to 3 metres tall depending upon the rainfall. A small number of bulbous herbs, ennials are also quite common. Producers are mainly grasses like species of anthium, Cynodon, etc.

2. **Consumers** : These occur in the following sequence—

(a) **Primary consumers** : The herbivorous animals are primary consumers like cows, ffaloes, deer, sheep, rabbit, mouse etc., which feed on grasses. Besides them, some ects, millipeds, etc., feed on the leaves of grasses.

(b) **Secondary consumers** : These are carnivorous animals like jackals, fox, snakes, gs, lizards, birds etc.

(c) **Tertiary Consumers** : Hawks feed on secondary consumers.

Thus they are considered as tertiary consumers.

(d) **Decomposers** : Different types of micro-organisms and fungi are decomposers. ngi are Aspergillus, Mucor, Penicillium, Rhizophus, Fusarium, etc. Other micro-organisms e different species of bacteria and actinomycetes. They bring the minerals back to the il, thus, making them available to the producers.

Use of grassland by local people :

(i) grazing of cattle, (ii) cutting fodder, (iii) collecting fuel-wood.

Cattle, sheep, goats are the grazing animals. The fodder is enough for the livestock of the local people. The local people also sell the fodder to nearest fodder-short areas.

Conclusion :

It has seen reported that the total forest and grassland area have decreased. The local people expressed their anxiety about the environmental change. The local people are also responsible for burning the forest and the grassland for construction of illegal buildings. Thus the utilisation level is unsustainable. The unlimited demand of ever-increasing human population is responsible for the destruction of the environmental assets.

References :

(i) Field guide to common trees of India : P. V. Bole and Y. Vaghani.
(ii) A Textbook on Env. Sc : Guhabaksi, Sen, Banerjee.

Acknowledgement :

I express my deep sense of gratitude to Prof. .... of. .... Dept. for providing necessary guidance & suggestion for the field work.

I am thankful to my classmates of my team for their friendly assistance.

....

Date ....   Signature of the student.

OJECT-2 VISIT TO A LOCAL POLLUTED SITE

◆ **Aim and objectives** : To study the cause and effects of various types of pollution the polluted site.

◆ **Introduction** : Pollution occurs from a variety of sources at the polluted site. Air tion due to smoke, gases, pesticides, water pollution due to industrial effluents, ides and fertilizers and sewage water, soil pollution by chemicals, solid waste released urban and industrial area which affect the biodiversity of the local area.

◆ **Preparation** : A few groups of students were made to observe the sources of pollution and to identify the effects of pollution at the site. A hand map was made the field-work purpose.

◆ **Requirements** : Note book, Pen, Pencil, Eraser, Hand lens, camera, water itoring kit etc.

◆ **Procedure** : A place was selected near our college for the field-work. Various mation were collected from the local people regarding the effects of the pollution. health aspects associated with the pollutant were studied from literatures. A report prepared on the findings.

Name of the site ____________________   J. L. No. ____________________

Date of visit ____________________   District ____________________

◆ **Type of the site** : May be rural agricultural area with polluted water body; polluted ustrial area. May be urban area, solid waste mangement site, polluted industrial area

◆ **Observations** :

Components in the garbage, polluted waterbody, industrial chimneys.

(i) Solid waste — garbage dump.

(ii) Polluted water of the river.

(iii) Gaseous effluents / Smoke coming out from industry etc. were observed and corded.

The waste were categorised into three groups :

(i) **Degradable wastes** [which are easily decomposed by microorganisms.] : Food astes, plant material, animal carcasses etc.

(ii) **Non-degradable wastes** [which are not easily decomposed by micro-organisms] plastic, glass, iron etc.

(iii) **Toxic wastes** [which are poisonous and cause long term effects on plants and animals : Chemicals, paints, sprays etc.

A. Garbage dumps : One of the enviromental problem sites is a garbage dumping area. Due to increase of non-biodegradable disposable consumer goods and lack of awareness of the management of waste at the household level, garbage is produced everyday. No one really thinks about the garbage and the effects related to it.

Garbage is a source of various diseases and site for large population of flies, cockroaches and rats that are responsible for the spread of diseases. Plastics are not degraded in nature and hence remain for a long time in the envirommment, thus adding to the need for more dumps. For many years waste has also been dumped into oceans, rivers or on land. It contributed to contamination of soil, groundwater under the dumping site.

B. Households : The garbage which is generated in the homes is termed domestic waste, while a community's waste is referred to as the municipal waste. This is classified as kitchen waste, which is degradable and non-biodegradable home waste consisting of plastic, glass and metal. Rich people are responsible for production of maximum amount of non-biodegradable solid waste due to their life style.

C. Agriculture : Agricultural waste consists of biomass including farm residues such as rice-husk, straw, bagasse, etc. which are used for generating power of producing paper. Waste material from fields consists of fertilizers and pesticides which have bad effects on aquatic animals and plants.

D. Industries : Industrial solid waste includes material from various industries or mines. Industries produce soild wastes during manufacturing processes. Chemicals have serious environmental ill effects, as they are toxic. Degree of pollution depends upon the method of disposal of the industry.

The waste which is generated during mining remains in the environment nearly indefinitely as these are non-biodegradable waste. Solid waste is also generated as a result of excavation and construction works.

E. Hospitals : Cotton dressing and bandages with blood or other tissue fluids and pus, all of which can contain pathogens and can spread bacteria, fungi and viruses. Used needles, syringes, bottles, plastic bags, operation theatre waste, such as tissues, blood, plastic disposable equipment should be Climinated through proper disposal system. The hospital should have a waste separation system at source to separate biomedical waste, glass, plastics etc. These wastes can be autoclaved or incinerated so that micro-organisms are killed. In maximum hospitals and health centres people have the tendency to throw all the waste products outside or nearer to the centre. It is dangerous for public health.

Use of water in the locality :

Agriculture : (i) Irrigation 77%
(ii) Livestock 01%
Power 13%
Idustries 3%
Municipal and rural water : 6%

◇ **Source of Contamination of water :**

(i) Domestic wastes (ii) Industrial wastes (iii) Agricultural waste (iv) Run-off water from urban areas (v) Soluble effluents (vi) Waste water treatement lagoons (vii) Mine spills (viii) Seepage pits (ix) Transport accidents (x) Garbages (xi) Septic tanks (xii) Refuse dumps (xiii) Barnyard Manures (xiv) Leaching.

◇ **Report Collected from local people about the effects of Polluted water :**

(i) Polluted water is the cause of epidemics and chronic diseases. It causes typhoid, jaundice, dyssentry, diarrhoea, tuberculosis and hepatitis.

◇ **Pollutants of water :**

(i) Industrial effluents containing Fe, Mn, Pb, free chlorine, phenols, aquatic actinomycetes.

(ii) Decomposed organic matter, algae, fungi, bacteria etc. Other micro-organisms are oscillatoria, rivularia, Anabaena & Dinobryon etc.

◇ **Air Pollutants :**

(i) Pollen grains, bacteria, products of volcanic eruption, fog are the natural contaminants.

(ii) Aerosols like dust, smoke, mist, fog and fumes from industries.

(iii) Gases & Vapours (SO_2, No_x, O_3, CO, CO_2, HF, HCl, Hydrocarbons, Radioactive gases) of refineries, plants, industries.

◇ **Reports collected from local people about the effects of air pollutants :**

◇ **On plant** : (i) Collapse of leaf, suppressed growth, Necrosis, chlorotic bleaching of leaves, Chlorosis, abscission and reduction of yield.

◇ **On Human** : (ii) Headache, nausea, vomitting, dizziness, convulsions, coma, eye irritation, respiratory problems & diseases, lungs cancer, cardio-vascular diseases, nerve, brain & kidney damage etc.

◇ **Inference** : It is found that the area is polluted due to the waste product of health centre, households and small industries. Absence of autoclave or incineration in Health centre is a threat to the environment. People should be aware about the contamination, otherwise diseases will be spread rapidly in the locality.

◇ **References :**

(i) A Textbook of Env. Science—Guhabaksi Sen, Banerjee
(ii) NCERT Biology—Khosla & Mehta.

Acknowledgement :

I express my deep sense of gratitude to Prof. .... of. .... Dept. for providing necessary guidance & suggestion for the field work.

I am thankful to my classmates of my team for their friendly assistance.

....

Date ....

Signature of the student.

PROJECT-3

STUDY OF COMMON PLANTS, INSECTS AND BIRDS

❖ **Aim** : To study of common plants, insects and birds of a selected site including the feeding & territorial behaviour of animals and birds and role of plants, insects and birds in the ecosystem.

❖ **Introduction** : Several plants, insects, birds, and other animals can be seen around an urban or rural setting where there is some vegetation. Each and every species of animals and plants has a definite role in the ecosystem. It is very interesting to observe the behavioural nature of the animals, their feeding and breeding habit etc.

❖ **Preparation** : A few groups of students were made to observe the sources of the pollution and to identify the effects of pollution at the site. A hand map of the areas was made for the field-work purpose.

❖ **Requirement** :

A pair of binoculars, field guide to identify plants, insects, birds, reptiles and mammals.

❖ **Observations** : Plants, insects, birds, reptiles and mammals use identified and their position in the ecosystem and food-chain were marked and noted.

Name of the Species	Scientific Name	Group	Identifying Character	Role in ecosystem	Current Status
Flame of the forest	*Butea monosperma*	Tree	Deciduous with red flowers	Producer	Rare
Silk cotton tree	*Bombax ceiba*	Tree	Deciduous tree	Do	Rare
Gulmohar	*Delonix regia*	Tree	Branches of the tree yellow & Red flower	Do	Rare
Copper pod	*Peltophorum ferrugrium*	Tree	Small yellow flower	Do	Rare
Camel's foot	*Bauhinia purpurea*	Tree	Trunkless, Medium height white & light yellow flower	Do	Rare
Indian gum arabic	*Acacia trilotica*	Tree	Deciduous, medium height	Do	Rare
Indian Cork tree	*Millingtonia hortensis*	Tree	Deciduous tree with beautiful flower	Producer and living place of many birds and animals	Common
Banyan tree	*Ficus benghalensis*	Tree	Deciduous tree with prop root pillar-like branches	Do	"
Bo tree	*Ficus religiosa*	Tree	Deciduous tree	Gives fruits for others	"

ame of he Species	Scientific Name	Group	Identifying Character	Role in ecosystem	Current Status
argosa	*Azadirachta indica*	Tree	Deciduous tree	Gives fruits for others	Rare
ango	*Mangifera indica*	Tree	Evergreen plant	"	"
anila tamarind	*Pithecolobium dulce*	Tree	Deciduous plant	"	"
lack plum	*Syzigium cumini*	Tree	"	"	"
luster fig	*Ficus glomerata*	Tree	"	"	"
oconut	*Cocos nucifera*	Tree	"	"	"
Tulasi	*Ocimum sanctum*	Herb	Weak stem	Producer Medical plant	Abundant
parajeeta	*Clitoria ternatea*	Herb climber	Climber stem with tendrils	"	"
almegh	*Andrographis paniculata*	Shrub	Soft branches stems single leaves	"	"
ayantara	*Catharanthus rosera*	Shrub	"	"	Common
asak	*Justicia adhatoda*	Shrub	Small in height, evergreen, plant with simple leaves	Producer	"
hankuni	*Centella asiatica urban*	Herb climber	Perennial herbicious plant with hollow internodes and flexible stem	Producer Medical plant	Abundant
esut	*Eclipta alben hask*	Shrub	Small in height, branched, simple leaves	Producer Medical plant	rare

INSECTS :

Common Name	Scientific Name	Type	Relation with human
Housefly	*Musca nebula*	Harmful insect	Spreads diseases like typhoid, cholera etc.
Honey bee	*Apis indica*	Useful insect	Produces honey, wax.
Lepisma	*Lepisma sp.*	Harmful insect found in old books	Destroys papers and books
Cockroach	*Periplaneta americana*	Harmful insect	Spreads disease and destorys cloths, papers

Common Name	Scientific Name	Type	Relation with human
Majra poka	*Tryporyza incertulas*	Harmful for agricultural point of view, primary consumer	Destroys rice plants
Moths	*Bombyx mori*	Useful insect primary consumer	Produces silk
Mosquito	*Anopheles sp.* *Culex sp.* *Ades sp.*	Harmful insect	Causes Malaria, Fileria etc.
Rice Bug	*Leptocorisa acuta*	Harmful	Destroys Rice

Birds are secondary consumers of the ecosystem

Name	Scientific name	Identifying characters	Feeding habit
House sparrow (Passer)	*Passer domesticus*	Black throat and grey crown	Insects, grains seeds
Crow	*Corvus splendous*	Black with greyish colour, sky-blue neck	Feeds on almost all edibles (omnivorous)
Parrot	*Psittacula krameri*	Green with red bill	Fruits vegetables
Pigeon	*Columba livia*	Blue grey body, multicolour sheen on neck, dark streaks on wings	Grains, seeds, insects
Dove	*Streptopelia sp.*	Light brown and grey colour, sign of peace	Grains and seeds
Cuckoo	*Hierococcyx varius*	Ash-grey coloured brown and white patches on the under side	Grains, insects, larva
Koel	*Eudynamis scolopacesus*	Indian nightingale, male has black plumage with greenish bill. Female has brown colour with white spots	Grains, insects, larva

Name	Scientific name	Identifying characters	Feeding habit
Hoopoe	*Upapa epops*	Zebra-like markings fan-shaped crest and long bill	Digs out insects from crevices
Wood pecker	*Branchypternus begalensis*	Golden-coloured bird with long bill and crown	Takes out insects from the trees
Kingfisher	*Alcedo sp.*	Large beak, found near water bodies	Feeds on small fishes, tadpoles
Bulbul	*Molpaster sp.*	Feathery crest, present, Brown coloured with black head and crimson patch under the tail	Grains, seeds
Kite	*Milvus migrans*	Large size, dirty brown coloured. Forked tail, curved beak, stout claws, sharp eyes	Insect, rat, toad, small birds, snake
Vulture	*Sarcogyps calvus*	Head and neck are naked. Large-sized bird of prey	They feed on carcasses

◆ **Comment :** Each animal has a definite role in ecosystem. Plants are producers, insects are primary consumers and birds are secondary consumers or some time tertiary consumers. Presence of these animals keep the natural balance of the ecosystem. They are the members of different trophic levels of food-chain and food-web.

◆ **References :**

(1) The book of Indian birds : Salim Ali
(2) The book of Indian Animals : Parter S. H.
(3) The book of Indian Reptiles : Daniel J.C.
(4) Field Guide to the Common Trees of India— Bole & Vaghani

Acknowledgement :

I express my deep sense of gratitude to Prof. .... of. .... Dept. for providing necessary guidance & suggestion for the field-work.

I am thankful to my classmates of my team for their friendly assistance.

....

Date ....

Signature of the student.

PROJECT–4

STUDY OF SIMPLE ECOSYSTEM

Aim : To study the natural ecosystem (Pond Ecosystem)

Introduction : A pond is a highly dynamic mini ecosystem. which changes rapidly during the year. To study a pond we should, as far as possible, cover all its phases (i) The monsoon phase, when the pond changes from a dry to a wet (aquatic) state (ii) The growing phase, when it is colonised by microflora and fauna and then other forms of macroscopic life. (iii) The mature aquatic phase, at the height of the monsoon when it is full of life. In dry season the pond begins to shrink. Its periphery becomes dry and is colonised by grasses and herbs. Its aquatic flora and fauna dies, giving place to land-flora and fauna. Eventually it may only remain in the form of a ditch containing dormant aquatic invertebrates such as insects that must await the next monsoon.

✧ **Requirement** : Note book, Pen Camera, Hand lens, Net glass-Jar etc.

✧ **Preparation** : The Students were divided into few groups to observe the pond ecosystem. A hand map was drawn for the purpose.

✧ **Observation** : The colour of the water of the pond is greenish. It indicates the presence of plankton (Phyto Plankton & Zoo-plankton). The water is slightly turbid which indicates the presence of fine suspended particles.

Musty taste and grassy odour indicates the presence of algae, bacteria & pathogens.

The ecosystem of the pond has been studied.

• **Pond—an example of typical ecosystem :**

Pond is a fresh water self regulated typical ecosystem.

(a) Abiotic components : All non-living components of a pond are called as abiotic components. These are water, oxygen, carbon dioxide, nitrogen, calcium, phosphorus and their compound, humic acid, amino acid etc. The light, temperature, pH, salinity etc. of the pond ecosystem also are the abiotic components.

(b) Biotic components :

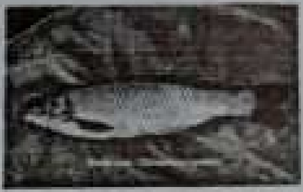
On the basis of the depth of water of the pond and types of vegetation and animals of the ecosystem there may be three different zones in a pond—littoral, limnetic and profundal. The littoral zone is the shallow water region which is occupied by rooted plants including grasses. In the limnetic zone associated organisms are green and blue-green algae, a variety of zoo-plankton, small crustaceans, fishes, amphibians and larger insects. In the deep water parts profundal zone there is no effective light penetration. The associated organisms are snails, musseles, crabs and worms.

---

1. **Producers** : There are two types of producers which are present in pond ecosystem are microphytes and macrophytes. Microphytes are minute floating plants i.e. phytoplanktons algae like Oedogonim, Spirogyra, Ulothrix, etc., are included in this group.

Macrophytes grow in shallow water and they are partly or completely submerged rooted large plants. Plants like Hydrilla, Vallisneria, Trapa, Typha, Nymphaea, etc., are included in this group of Macrophytes. There are some free-floating macrophytes like Salvinia, Azolla, Pistia, Wolffia, Lemna, etc.

Oreochromis niloticus (Tilapia)



Heteropneustes fossilis

Bhetki: Lates calcarifer

Cyprinus

Magur (Clarias batrachus)

Labeo rohita

[illegible]

Calbos Labeo Calbusa

Bata: Labeo bata

Catla catla

Koi Anabas testudineus

Chital: [illegible]

Cirrhinus mrigala

The green plants convert the solar energy into chemical energy through the process of photosynthesis. The chemical energy which is stored in the form of food [glucose] is utilised by all the organisms. Oxygen which is evolved by the producers during photosynthesis is utilised in respiration by all the living organisms.

2. Consumers : The common primary consumers are of two types—(a) zooplankton and (b) benthos. Amoeba (a protozoan, Daphnia, Cyclops (arthropod), etc., constitute the zooplankton while snails, small fishes, etc., constitute the benthos. They are called primary consumers as they feed on green plants and algae. Frogs, big fishes, water snakes, crabs, snails, etc., are the secondary consumers which consume primay consumers.

In the pond, besides the secondary consumers, there are consumers of highest order such as water birds, turtles, etc. They are called tertiary consumers.

3. Decomposers : A large number of fungi and bacteria attack dead bodies of the aquantic plants and animals and convert the complex organic substances into simple inorganic compounds and elements. Aquatic bacteria, fungi like Aspergillus, Rhizophus, Fusarium, etc. are the decomposers. The chemical elements which are liberated by decomposers are again utilised by green plants in their nutrition.

✧ **Comment** : Pond as a whole serves a good example of fresh water ecosystem. It exhibits a self-sufficient, self-regulaty system.

✧ **References** :

(1) Introduction to Life Science Bhattacharya & Chaudhuri.
(2) A Textbook of Env. Science = Guhabakshi, Sen, Banerjee.

Acknowledgement :

I express my deep sense of gratitude to Prof. .... of. .... Dept. for providing necessary guidance & suggestion for the field work.

I am thankful to my classmates of my team for their friendly assistance.

....

Date .... Signature of the student

VIDYASAGAR UNIVERSITY QUESTION

Group–A

2017

1. **Answer any 20 (Twenty) questions :** **20×2=40**

(i) (a) One source of water pollution ________.
(b) One Mosquito (vector) borne virus disease ________.
(ii) (a) Long action Insecticide is ________.
(b) What do you mean by Red Data Book?
(iii) Two protozoa borne diseases are ________.
(iv) Name the gases released from decaying animal body.
(v) In ________ (year) 'Kyoto Protocol' was signed against the emission of ________.
(vi) Full from of I.C.A.R. ________.
(vii) Two hotspots of India ________.
(viii) In the year ________ at ________ JEM was started.
(ix) The visit of Noise level is ________.
(x) Full form of LPG ________.
(xi) Name two Tiger Profeet in India.
(xii) Name two water borne diseases.
(xiii) What do you mean by degradation of Environment?
(xiv) What do you mean by Food from 'Bio-technology'?
(xv) Full form of DDT ________.
(xvi) What is food chain?
(xvii) Name one National Wet Land Conservation Site of India.
(xviii) What is Biome?
(xix) Examples of Mangrove Mans are ________ and ________.
(xx) Full form of CSE & CEE ________.
(xxi) What is Biomedical Waste?
(xxii) What is Biophere Reserve?
(xxiii) What is Bio-Indicator?
(xxiv) Environment conservation ________ was established in his year ________.
(xxv) Name two renewable energy sources.
(xxvi) What is ozone loss at statospheric layer?
(xxvii) The ________ level is reduced due to acid Rain.
(xxviii) What is community Health Education?
(xxix) What is Joint forest Management?
(xxx) What is Carbon Trading?

Group–B

2. Answer any Three questions : 10×3=3

(a) What is air pollution? Mention the causes. Discuss the effects of air pollution o human beings at ethics.

(b) Short Notes on :

(i) Chernobyl accident.

(ii) Diseases from contaminated water.

(iii) Arsenic Pollution

(c) Discuss the process of water conservation. Write a short note on Silent valley Movemen Mention the causes and effects of Acid rain. (2+3)+(2+3

(d) What is Earrying Capasity? Mention the effects of population explosian on environme Mention the projects family welfare of India.

(e) What is Bio diversity? Calculate the values of it. Mention the threats of it. 2+3+5

(f) Mention the components of Ecosystem. Explain energy flow. Difine Ecological Pyrami with example. 2+4+4

Group–A

2018

1. **Answer any 20 (Twenty) questions :** 20×2=40

(i) Name protozoa borne diseases.

(ii) What is food chain?

(iii) Name two gases released from decaying animal bodies.

(iv) In the year ________ Kyoto Protocol was signed to reduce ________.

(v) Full from of I.C.A.R. ________.

(vi) Two hotspots of India ________.

(vii) Full form of JFM ________.

(viii) The unit of measurement of Noise level is ________.

(ix) Full form of LPG ________.

(x) Two Tiger Profect in India ________.

(xi) What is Environment degradation?

(xii) What is genetically modified food?

(xiii) Full form of DDT ________.

(xiv) National wetland of India ________.

(xv) What is Biomass?

(xvi) Full form of CSE & CEE ________.

(xvii) What is Bio-Medical waste?

(xviii) What is Community Health Education.

(xix) What is Carbom Trading?

(xx) What is Sanctuary?

(xxi) Name the place where the Chipko Movement was organised.

(xxii) Mention any two problem of Rural environment.

(xxiii) Name two non-infections diseases.

(xxiv) Name two endangered species of India.

(xxv) Mention two reasons for food conservation.

(xxvi) What is Environmental Ethics?

(xxvii) Mention two causes of Noise Pollution.

(xxviii) Mention two threats on Bio-diversity.

(xxix) Mention two ways to reduce the air pollution.

(xxx) What is Environment.

Group-B

2. Answer any Three questions : **10×3=30**

(a) What is Environmental Movements? Discuss about the movements in India.

(b) Discuss on Forest Eco system.

(c) Mention different types of Bio diversities. Discuss on the threats on Biodiversities.

(d) Mention the difference between Development and sustainable development.

(e) Mention the Roles of Information technology on Environment Protection.

(f) Discuss on five individual and five joint projects to solve the local environmental problems of your area.

(g) Discuss on the prospect important of the development of the renewable energy sources.

2016

Environmental Studies

Full Marks–75

(For General Candidates of Humanities/Science/Music Group)

Please carefully read the instruction given in the answer sheet

Candidates are required to give their answers in their own words as far as practicable

Test Booklet Code—2

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25

1. **The water body with very high nutrient content is known as–**
(a) Mesotrophic (b) Oligotrophic (c) Eutrophic.

2. **The scale that measures the magnitude of earthquake is–**
(a) Kelvin (b) Joule (c) Richter.

3. **Bharat stage – IV is related to–**
(a) Solid Waste Management (b) Automobile emmission (c) Noise pollution.

4. **Pollen can cause–**
(a) Dysentery (b) Tuburculosis (c) Allergy.

5. **Free floating aquatic microscopic organisms are known as–**
(a) Nekton (b) Plankton (c) Periphyton.

6. **Lotic water means–**
(a) Lake water (b) Running water in river (c) Ocean water.

7. **SPM in air is measured by–**
(a) High volume sampler (b) Hygrometer (c) Barometer.

8. **Chemical, Physical or biological agents that cause birth defect are called–**
(a) Mutagen (b) Oncogen (c) Teratogen.

9. **Which one of the following is not found in India?**
(a) Jaguar (b) Red Panda (c) Rhinoceros.

10. **The flow of energy in an ecosystem is–**
(a) Unidirectional (b) Bidirectional (c) Tridirectional.

11. **In atmosphere main source of oxygen is–**
(a) Excretion (b) Respiration (c) Photosynthesis.

12. Terrestrial part of earth is called–
(a) Biosphere (b) Lithosphere (c) Stratosphere.

13. Orchid is one type of–
(a) Saprophyte (b) Halophyte (c) Epiphyte.

14. The Ramsar site of West Bengal is–
(a) Subhash Sarovar (b) Rabindra Sarovar (c) East Kolkata Wetland.

15. The number of biodiversity hotspot in India–
(a) 2 (b) 3 (c) 4.

16. Example of tropical Savanna Biome is–
(a) Dooars (b) Grasslands of Australia (c) Terai.

17. Activated sludge process is associated with–
(a) Air purification (b) Water purification (c) Solid waste purification.

18. Confinement of species in a particular area is described as–
(a) Endemic (b) Epidemic (c) Exotic.

19. El Nino results in–
(a) Hot oceanic wave (b) Cold Oceanic wave (c) Tsunami.

20. Sandfly is responsible for–
(a) Plague (b) Amoebiosis (c) Kala-azar.

21. Which one of the following is found in India?
(a) Macaw (b) Emu (c) Alexandrine Parakeet.

22. The silent valley movement occurred in–
(a) Uttarakhand (b) Gujarat (c) Kerala.

23. The Wildlife Protection Act was enacted in–
(a) 1972 (b) 1973 (c) 1971.

24. The Skin Cancer is caused by–
(a) The Green House Effect (b) U-V rays (c) None of these.

25. Green Peace is–
(a) Government Policy (b) N.G.O. (c) Administrative treaty.

ANSWERS

1.(c) Eutrophic; 2. (c) Richter; 3. (b) Automobile emmission; 4. (c) Allergy; 5. (b) Plankton; 6. (b) Running water in river; 7. (a) High volume sampler; 8. (a) Mutagen; 9. (a) Jaguar; 10. (a) Unidirectional; 11. (c) Photosynthesis; 12. (b) Lithosphere; 13. (c) Epiphyte; 14. (c) East Kolkata Wetland; 15. (c) 4; 16. (b) Grasslands of Australia; 17. (b) Water purification; 18. (a) Endemic; 19. (a) Hot oceanic wave; 20. (c) Kala-azar; 21. (c) Alexandrine Parakeet; 22. (c) Kerala; 23. (a) 1972; 24. (b) U-V rays; 25. (a) Government Policy .

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages **10×5**

Passage-1

26. The aim of the Stockholm Conference was to lay emphasis on basic concepts such as the quality of life, environmental knowledge and awareness and participation of people. The first International Conference in India on environmental education was held in 1981. The Bhopal gas tragedy in 1984 was a wake up call that alerted the Government of India to the need for disaster management and environmental awareness and education at all levels of society. So in 1999 the Supreme Court of India issued order to the Central Government for the introduction of a common course of Environmental Studies at the under graduate level for different streams in all Colleges and Universities.

Statement 1 : The first conference on environmental education in India took place in 1981.

Statement 2 : The Government issued order to start a common course on environmental studies at under graduate level of all colleges.

Statement 3 : The Bhopal Gas Tragedy was a wake up call for the Government of India to introduce disaster management and environmental awareness to society.

Ans. ○ ● ●
1 2 3

Passage-2

27. The term Monsoon has been derived from the Arabic Word Mausin which means season. Hence monsoon is a seasonal or periodic wind. Unlike planetary winds the direction of monsoon circulations changes in alternating seasons. The monsoon winds are mostly confined in tropics covering wide areas ranging from 25° S to 35° N latitude and from 45° W to 140° E longitude. The monsoon winds have been ideally developed over India. So, India is sometimes referred as land of monsoon.

Statement 1 : Monsoon is not fully developed over India.

Statement 2 : Monsoon is a periodic wind.

Statement 3 : Many referred India as land of monsoon.

Ans. ○ 1 ● 2 ● 3

Passage–3

28. Noise can be defined in many ways. The sound which is without a pleasing note, undesirable, uncomfortable and irritating to recipient may be called as noise. Noise pollution is defined as unwanted sound that cause discomfort, disturbance and irritation and interfere with normal verbal communication and has ill effects on mental and physical health. The extent of noise pollution generally depends on intensity of noise and its duration. The intensity level of sound is expressed in the unit of decibel. The safe intensity of sound as prescribed by WHO is 45dB. Even if a sound level of 45dB is continuously experienced by our ear, we feel irritated. Our sleeping may be disturbed. A noise of 80dB may cause anger while a noise of 85 dB starts damaging of ear.

Statement 1 : The intensity level of sound is expressed in decibel.

Statement 2 : The safe intensity level of sound is 85dB.

Statement 3 : Sound which is undesirable can be defined as noise.

Ans. ● 1 ○ 2 ● 3

Passage–4

29. We get energy from some energy sources, for example, heat energy by combustion of coal. So, coal is an energy resource. Energy resources can be classified into two types– renewable energy and non-renewable energy. Nature has infinite amount of renewable energy resources. By applying these we can prepare new kinds of energy. *Solar* energy, wind energy, web and flow of oceans fall in these category. These resources are generated in nature itself. By introducing proper planning we can utilise these energies.

Statement 1 : Solar energy is a renewable energy resource.

Statement 2 : Nature has infinite amount of non-renewable energy resources.

Statement 3 : By introducing proper planning energy resources of the nature can be utilised.

Ans. ● 1 ○ 2 ● 3

2017

Environmental Studies

Full Marks–75

For B. Com. Candidates

Please carefully read the instruction given in the answer sheet

ndidates are required to give their answers in their own words as far as practicable

Test Booklet Code—2

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25

1. **The water body with very high nutrient content is known as —**
(a) Mesotrophic (b) Oligotrophic (c) Eutrophic.

2. **The book written by Rachel Carson is —**
(a) Silent spring (b) The Voyage of Beagle (c) Inferno.

3. **The blue baby syndrome is caused by the contamination of water due to —**
(a) Phosphate (b) Arsenic (c) Nitrate.

4. **The most toxic air pollutant from petrol car is —**
(a) CO_2 (b) SO_2 (c) Hydrocarbon.

5. **Bhopal gas tragedy occurred due to leakage of —**
(a) Methyl isocyanate (b) SO_2 (c) NO_2

6. **One of the leaders of Narmada Bachao Andolon is —**
(a) Sundarlal Bahuguna (b) Medha Patekar (c) R. K. Pachauri.

7. **The Silent Valley movement occurred in —**
(a) Uttarakhand (b) Gujarat (c) Kerala.

8. **Plants tolerant to desert condition are —**
(a) Halophyte (b) Xerophyte (c) Hydrophyte.

9. **The state bird of West Bengal is —**
(a) Drongo (b) King fisher (c) Pigeon.

10. **Example of Tropical Savana Biome is —**
(a) Dooars (b) Grasslands of Australia (c) Terai.

11. **Keoladeo National Park is located in one of the following states : —**
(a) Gujarat (b) Rajasthan (c) Maharashtra.

12. Sardar Sarovar dam is situated in —
(a) Madhya Pradesh (b) Gujarat (c) Rajasthan.

13. World Water Day is celebrated on —
(a) 5th June (b) 22nd March (c) 22nd April.

14. Example of Lentic water is —
(a) Running water in river (b) Lake water (c) Ocean water.

15. Apico movement took place in —
(a) Kumaon region (b) Himachal region (c) Karnataka.

16. SPM in air is measured by —
(a) High Volume Sampler (b) Hygrometer (c) Barometer.

17. The element responsible for itai-itai disease is —
(a) Mercury (b) Arsenic (c) Cadmium.

18. Which one of the following is not found in India ? —
(a) Lion (b) Leopard (c) Cheetah.

19. The energy flow in the food-chain is —
(a) One-way (b) Two-way (c) Three-way.

20. Intensity of solar radiation is measured by —
(a) Hygrometer (b) Luxmeter (c) Nephalometer.

21. Which one is a non-renewable energy source ? —
(a) Solar energy (b) Wind energy (c) Fossil fuel.

22. Wildlife Protection Act was enacted on —
(a) 1972 (b) 1982 (c) 1992.

23. The novel 'Aranyak' is written by —
(a) Rabindranath Tagore (b) Bibhutibhusan Bandopadhyay
(c) Jibanananda Das.

24. The 'Arabari Model' in West Bengal is famous for —
(a) Joint Forest Management
(b) Solid Waste Management
(c) Mangrove Conservation Centre

25. Malaria disease is —
(a) Water borne (b) Vector borne (c) Air borne.

ANSWERS

1. (c) Eutrophic; 2. (a) Silent spring; 3. (c) Nitrate; 4. (c) Hydrocarbon; 5. (a) Methyl isocyanate; 6. (b) Medha Patekar; 7. (c) Kerala; 8. (b) Xerophyte; 9. (b) King fisher; 10. (b) Grasslands of Australia ; 11. (b) Rajasthan; 12 (b) Gujarat; 13. (b) 22nd March; 14. (b) Lake water; 15. (c) Karnataka; 16. (a) High Volume Sampler; 17. (c) Cadmium; 18. (c) Cheetah; 19. (a) One-way; 20. (b) Luxmeter; 21. (c) Fossil fuel; 22. (a) 1972 ; 23. (b) Bibhutibhusan Bandopadhyay; 24. (a) Joint Forest Management; 25. (b) Vector borne.

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages 10×5

Passage–1

26. Atmosphere is the reservoir of free gaseous nitrogen as its constitutes nearly 78 per cent of the atmosphere by volume. The free gaseous nitrogen in the atmosphere is converted to ammonia or oxidized to nitrate forms at different stages. Nitrogen fixing bacteria and blue green algae play significant role in converting the gaseous nitrogen into organic compounds and finally to nitrates soluble in water. Nitrates are utilized by plants for the synthesis of amino acids and proteins. When plants and animals die or their remains are decomposed by various organisms, the nitrogen is again released in the atmosphere.

Statement 1 : Approximately 22 per cent of atmosphere is composed of Non-nitrogen gase.

Statement 2 : Nitrates are utilized by plants for the protein synthesis.

Statement 3 : The free gaseous nitrogen in different stages is first converted into nitrites.

Ans. ○ ● ●
1 2 3

Passage–2

27. The aim of the Stockholm Conference was to lay emphasis on basic concepts such as the quality of life, environmental knowledge and awareness and participation of people. The first international conference in India on environmental education was held in 1981. The Bhopal gas tragedy in 1984 was a wake up call that alerted the Government of India to the need for disaster management and environmental awareness and education at all levels of society. So in 1999 the Supreme Court of India issued orders to the Central Government for the introduction of a common course of Environmental Studies at the Under Graduate level for different streams in all Colleges and Universities.

Statement 1 : The First International Conference on environmental education in India took place after Bhopal gas disaster.

Statement 2 : The Government issued the order to start a common course on environmental studies in the last year of 20th Century.

Statement 3 : The Bhopal Gas tragedy was a wake up call for the Government of India to introduce disaster management and environmental awareness to society.

Ans.	●	●	○
	1	2	3

Passage–3

28. In the early 1990's there were at least 80 million vultures in India and Pakisthan. Yet, within a decade the vulture population declined by 97-99%. Scientists discovered that the vultures were dying of kidney failure due to the drug diclofenac. The vultures were eating dead cattle that had been given diclofenac, a low cost pain killers. Vultures are very sensitive to diclofenac. Even a small amount of diclofenac was deadly to the vultures.

The vulture is the world's most efficient scavenger, but it is also slow breeder. It lays just one egg every year. Thus the breeding could not match the speed with which the vultures were dying. In 2006, India, Pakisthan and Nepal banned the use of diclofenac for cattle. It is a ray of hope that vulture population in India did not decline during 2007 to present time and may have even increased slightly.

Statement 1 : At present, vulture is a frequently seen bird in India.

Statement 2 : Diclofenac is an expensive drug that causes damage to the liver in vultures.

Statement 3 : The reproductive success rate of vulture is very slow.

Ans.	○	●	●
	1	2	3

Passage–4

29. Salinity tolerant forest ecosystem is called mangrove. It is observed in the deltas of tropical and subtropical water-flooded low lands. The mangrove forests of India are located in the well-protected river estuaries, in tidal wave flooded canals and in saline wet lands, Sunderban of West Bengal, North Andaman and Nicobor islands, Godabari delta, the estuary of the Krishna river, delta of the Mahanadi are designated as mangrove region. The trees important as mangrove plants are Garan, Geoa, Garjan, Keora, Sundari etc. Tigers, Crocodiles, Deer, Prawns, Crabs, Water insects etc. reside in mangrove forests.

Statement 1 : Mangrove trees grow in salin wet land

Statement 2 : North Andaman is a mangrove region.

Statement 3 : Bisons are found in mangrove forests

Ans.	●	●	○
	1	2	3

Passage–5

30. The term monsoon has been derived from the Arabic word, mausin (Urdu mausam) which means season. Hence monsoon is a seasonal or periodic wind. Unlike planetary winds the direction of monsoon circulations changes in alternating seasons. The monsoon winds are mostly confined in the tropics covering wide area ranging from 25°S to 35°N latitude and from 45°W to 140°E longitude. The monsoon winds have been ideally developed over India. So, India is sometimes refered as land of monsoon.

Statement 1 : Monsoon is season dependent phenomenon.

Statement 2 : The term monsoon is derived from the Arabic word mausin.

Statement 3 : The monsoon winds are mostly confined in 25°S to 45°N regions.

Ans.	●	●	○
	1	2	3

2017

Environmental Studies

Full Marks–75

(For General Candidates of Humanities/Science/Music Group)

Please carefully read the instruction given in the answer sheet

Candidates are required to give their answers in their own words as far as practicable

Test Booklet Code—3

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25

1. **Name the lowest layer of atmosphere —**
(a) Troposphere (b) Turbosphere (c) Stratosphere.
2. **How much amount of total hydrological mass is usable fresh water?**
(a) 5% (b) 3% (c) 1%.
3. **The mostly found element in Lithosphere is —**
(a) Oxygen (b) Silica (c) Alumina.
4. **Tsunami is a type of —**
(a) High coastal wave due to the Earth's motion
(b) High mid-oceanic wave due to glaciations
(c) High coastal wave due to sub-oceanic earthquake.
5. **Which of the following is not a renewable resource?**
(a) Hydroelectric (b) Iron ore (c) Plantation.
6. **Which of the following leads to soil erosion?**
(a) Afforestation (b) Thermal power generation (c) Over grazing.
7. **Which activity does not lead to sustainable development?**
(a) Gender equality (b) Youth mobilization (c) Warfare.
8. **Desert ecosystem means an area where —**
(a) Temperature is always high (b) Thorny plants are found
(c) Rate of rainfall is lower compared to evaporation.
9. **Pond ecosystem is also known as —**
(a) Savanna (b) Mangrove ecosystem (c) Lentic ecosystem.
10. **Which of the following plant types are characteristic flora of Sundarbans?**
(a) Xerophytes (b) Mesophytes (c) Halophytes.
11. **India is a —**
(a) Mega-diversity country (b) Biodiversity hotspot (c) Paradiversity-country

Which of the following is a Ramsar Site?
(a) East Calcutta Wetlands (b) Rabindra Sarobar (c) Kulik Bird Sanctuary.
A major threat to biodiversity is —
(a) Habitat loss (b) Poaching (c) All of the above.
The gas responsible for Ozone layer depletion is —
(a) Carbon monoxide (b) Chlorofluorocarbon (c) Carbon Dioxide.
How can you reduce pollution problems caused by plastics?
(a) Burning the plastic materials
(b) Burning plastic materials under ground
(c) Reusing and recycling the plastic materials.
One of the major causes of marine pollution is —
(a) Oil spill (b) Municipal solid waste disposal (c) Over grazing.
Pre-disaster management involves —
(a) Relief operation (b) Establishment of shelters (c) Rescue operation.
Which among the following is the most ecofriendly mode of transport?
(a) Motorcycle (b) Bus (c) Electric Train.
Wildlife (Protection) Act was enacted in the year —
(a) 1971 (b) 1972 (c) 1975.
The full form of HIV is —
(a) Human Immunodeficiency Virus (b) Human Immunity Virus
(c) Human Immune Virus.
21. **Kyoto Protocol is concerned to —**
(a) Ozone Layer depletion (b) Solid waste management (c) Climate change.
22. **El-Nino is a —**
(a) Type of storm (b) Weather phenomenon related to ocean current
(c) Kind of Earthquake.
23. **The Gas responsible for Bhopal Gas Tragedy is —**
(a) MIC (b) Methane (c) NOx.
24. **Narmada Banchao Andolon was led by —**
(a) Medha Patkar (b) Sundarlal Bahuguna (c) Mahatma Gandhi.
25. **Which of the following is found in West Bengal?**
(a) Asiatic Ass (b) One Horned Rhinoceros (c) Thar.

ANSWERS

1. (a) Troposphere; 2. (c) 1%; 3. (b) Silica; 4. (c) High coastal wave due to sub-oceanic earthquake; 5. (b) Iron ore; 6. (c) Over grazing; 7. (c) Warfare; 8. (c) Rate of rainfall is lower compared to evaporation; 9. (c) Lentic ecosystem; 10. (c) Halophytes; 11. (a) Mega-diversity country; 12. (a) East Calcutta Wetlands; 13. (c) All of the above; 14. (b) Chlorofluorocarbon; 15. (b) Burning plastic materials under ground; 16. (a) Oil spill; 17. (b) Establishment of shelters; 18. (c) Electric Train; 19. (b) 1972; 20. (a) Human Immunodeficiency Virus; 21. (a) Ozone Layer depletion; 22. (b) Weather phenomenon related to ocean current; 23. (a) MIC; 24. (a) Medha Patkar; 25. (b) One Horned Rhinoceros.

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passage carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passage 10×5

Passage-1

26. Everyone of us requires a finite area of Earth's surface to support our existence. This is our 'Ecological Footprint'. Its principal components are, our food footprint, our wood products footprint, and our degraded land footprint. If I eat potatoes, in the course of a year, I consume a measurable quantity of potatoes. There is thus an area of potato production somewhere in the world that is dedicated solely to me for my annual consumption of potatoes. Same is true for other food products. That's my food footprint. This footprint has no definite measurement. I can change this measurement by changing my food habits.

Statement 1 : The surface area needed to stand on foot is called ecological footprint.

Statement 2 : Ecological footprint depends on the consumption of each and every individual.

Statement 3 : Ecological footprint is the finite area of Earth's surface to support everyone's existence on the Earth.

Ans. ○ ● ●
1 2 3

Passage

27. CITES is an international agreement among the Governments of various countries. Because the trade in wild animals and plants crosses beyond borders of the countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation. CITES was conceived in the spirit of such cooperation. Today, it accords varying degrees of protection to more than 30,000 species of animals and plants, whether they are traded as live specimens, fur coats or dried herbs.

Statement 1 : CITES is an international agreement to prevent the Trade in Wild animals and plants.

Statement 2 : CITES is a law for conservation of Nature.

Statement 3 : Presently, about 2000 species are protected by CITES.

Ans. ● ● ○
1 2 3

Passage-3

28. The rapid urbanization in developing countries creates a dilemma. Cities attract millions of people as a center of industries and commerce since long past. At present, the increasing structure of the city and migration of huge population raise questions about the quality of life there. Though there is no documentation of many city's carrying capacity, yet for many cities the increasing trend of human population overtakes the capability of urban administration.

Statement 1 : There is a known threshold of population for all the big cities.

Statement 2 : Urban administration does not have any mechanism to handle population growth in cities.

Statement 3 : Although there is no evidence of any threshold population for many cities, but in several cities the population growth have overtaken the capability of urban administration.

Ans. ○ ● ●
1 2 3

Passage-4

29. Biomonitoring is a branch of scientific research which analyses the tissues of humans or animals to detect and measure the subject's exposure to both natural and synthetic, or man-made chemicals. Both natural and synthetic chemicals leave their impact on the body in one way or another through "markers." These markers can either be the actual chemical which remains in the body's tissues, or the by-products of its breakdown.

Statement 1 : Markers of Biomonitoring are either an actual chemical of body or its by-products.

Statement 2 : Biomonitoring is a procedure of analysing biodiversity.

Statement 3 : Markers used in biomonitoring are generally external chemical agents.

Ans. ● ○ ●
1 2 3

Passage-5

30. An ecotone is a transition area between two adjacent ecological communities (ecosystems). It may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line. Changes in the physical environment may produce a sharp boundary, as in the example of a shoreline or the interface between areas of forest and cleared land. Elsewhere, a more gradually blended interface area will be found, where species from each community will be found together as well as unique local species. Mountain ranges often create such ecotones, due to the wide variety of climatic conditions experienced on their slopes.

Statement 1 : An ecotone is a transition area between two adjacent ecological communities.

Statement 2 : An ecotone always produce a sharp boundary.

Statement 3 : An Ecotone may appear on the ground as a gradual blending of the two communities across a broad area.

Ans: ● ○ ●
1 2 3

2018

Environmental Studies

Full Marks–75

(B. Com. Honours & Major)

Test Booklet Code—1

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25=25

1. **Which of the following is not a biotic resource?**
(a) Coal (b) Petroleum (c) Atomic energy

2. **Cause of 'Narmada Banchao Andolan' is**
(a) Mining (b) Construction of dam (c) Deforestation

3. **According to 'Indian Meterological Department' 40% less than normal rainfall can be termed as**
(a) Dry spell (b) Partially deficient year (c) Largely deficient year

4. **Term 'Biodiversity' was first coined by**
(a) Charles Darwin (b) Walter Rosen (c) E. P. Odum

5. **Biodiversity conservation in Botanical garden**
(a) in situ conservation (b) ex situ conservation (c) None of (a) or (b)

6. **BMP stands for**
(a) environmental monitoring part (b) environmental management plan
(c) environmental mitigation processes

7. **Which of the following is a bio gas?**
(a) gobor gas (b) LPG (c) CNG

8. **Silviculture includes**
(a) Bamboo cultivation (b) Silk cultivation (c) Lac cultivation

9. **Lichen is a symbiotic association between**
(a) a fungus with bacteria (b) an alga with another alga (c) a fungus and an alga

10. **The main cause of minamata disease is**
(a) Methyl mercury (b) Ethyl mercury (c) Arsenic

11. **Red panda is found in**
(a) Pakistan (b) Nepal (c) Java

12. **Which of the following is not a problem for 'better future'?**
(a) Promoting public transport (b) Promoting use of paper
(c) Utilization of solar power

13. Which of the following is most sustainable development goal?
(a) Promote universal education (b) Give importance to gender equality
(c) Take action combat climate change

14. Main cause behind 'Tsunami' is
(a) tidal wave (b) gravitation of moon (c) under sea earthquake

15. ESP are employed to remove particulate pollutants of the size of
(a) 5-20 μm (b) > 20-50 μm (c) > 50 μm

16. Abyssal zone is
(a) where photosynthesis takes place (b) cold and dark zone at the bottom of ocean
(c) less sunlight available

17. One orderly process of transition from one biotic community to another is called
(a) niche (b) edge effect (c) ecological succession

18. Nektons include
(a) Oyster and barnacles (b) fish and turtles (c) cyclopes and copepods

19. 'Jane godall' is related to
(a) Whale conservation (b) Chimpanzee conservation (c) Tiger conservation

20. What ideal percentage of its geographical area of a country should be under forest cover?
(a) 3% (b) 33% (c) 3·3%

21. One of the secondary air pollutant is
(a) CO_2 (b) NO_x (c) PAN

22. Agenda-21 was an outcome of the conference at
(a) Rio de Jenerio (b) Stockholm (c) Doha

23. Green Peace is
(a) Government policy (b) NGO (c) Administrative treaty

24. Vermicompost is produced with the help of
(a) Ants (b) Flies (c) Earthworms

25. Clouds as indicator of bad weather are
(a) Stratus (b) Cumulus (c) Cumulonimbus

ANSWERS

1.(c) Atomic energy; 2.(b) Construction of dam; 3.(b) Partially deficient year; 4.(b) Walter Rosen; 5.(b) ex situ conservation; 6.(b) environmental management plan; 7.(a) gobor gas; 8.(a) Bamboo cultivation; 9.(c) a fungus and an alga; 10.(a) Methyl mercury; 11.(b) Nepal; 12.(c) Utilization of solar power; 13.(c) Take action combat climate change; 14.(c) under sea earthquake; 15.(a) 5-20 μm; 16.(b) cold and dark zone at the bottom of ocean; 17.(c) ecological succession; 18.(b) fish and turtles; 19.(b) Chimpanzee conservation; 20.(b) 33%; 21.(c) PAN; 22.(a) Rio de Jenerio; 23.(b) NGO; 24.(c) Earthworms; 25.(c) Cumulonimbus.

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages 10×5=50

Passage-1

26. Productive lands for sustainable agriculture have been subject to deterioration day by day due to over exploitation. *Human Development Report*, 1998 states that since 1945 nearly 2 billion hectares of productive land have been degraded. This amounts to about one-sixth of the world's productive land. The carrying capacity of the land has thus been reduced substantially. Interestingly the loss of good cultivated lands has been spectacular in the developing countries. Nearly half of the world's degraded lands belongs to Asia and nearly one-fourth of the moderate to strongly degraded land lie in Africa. These parts of the globe require more food to feed ever increasing hungry people, where acute food shortages and famines are recurrent. Here live two-thirds of the world's poorest people. Hence land degradation has become a menace of great concern to the world community.

Statement 1 : Land degradation does not affect the carrying capacity of land considerably.

Statement 2 : Most of the degraded lands are not situated in the developed countries.

Statement 3 : Land degradation is not a major concern to the world community.

Ans. ○ ● ○
1 2 3

Passage-2

27. Organic substances in water, particularly waste water of industrial or municipal origin, are utilized as food by the microorganisms present in water for survival as well as for growth. Such organics are called biodegradable and include materials like starch, fats, proteins, alcohols, aldehydes, esters, etc., and may sometimes be the decomposition products of animal or plant origin. Microbial degradation of these materials may occur through oxidation (aerobic) or through reduction (anaerobic). In the former process, carbon dioxide (CO_2) and water (H_2O) are the end products, while the latter process yields a spectrum of products containing hydrocarbons, carbon dioxide, ammonia, hydrogen sulphide etc.

The most important effect of aerobic biodegradation of organics is lowering of dissolved oxygen level in water. Metabolism of organics by bacteria requires oxygen that comes directly from water. The dissolved oxygen concentration in water decreases as a result. The more is the concentration of biodegradable organics in water, the loss will be the concentration of dissolved oxygen in it. The amount of biodegradable organics present in water is not measured directly. It is rather measured in terms of the requirement of oxygen of the microbial degradation process which is called 'Biochemical Oxygen Demand' or BOD, and is expressed as milligram of oxygen consumed for the degradation of the organics present in one litre water. Estimation of BOD in a sample of waste water is done by measuring the change in the dissolved oxygen concentration in the sample, maintained at 20°C, over a period of 5 days following standard procedures. This is called BOD_5.

Statement 1 : Biological Oxygen Demand and amount of lowering of dissolved oxygen level in water are directly proportional.

Statement 2 : Organic pollutant in water are measured through BOD_5 test.

Statement 3 : Microbial degradation are only be anaerobic in nature.

Ans. ● ○ ○
1 2 3

Passage-3

28. In the temperate countries some economically important plants that cannot grow outside at a very low temperature during the winter are grown in glass-walled and glass-roofed growth chambers (known as glass houses) exposed to sunlight. Glass houses are also used in subtropical regions during the winter months and in relatively cold high altitude areas for high-value horticultural" annual cropsincluding flowers on a commercial scale as well as for research work especially for breeding of new varieties and crop physiological and pathological studies. Temperature within the glass house rises because the glass of the roof and walls though it allows entry of sunlight with little obstruction, resists the escaping of the reflected light of longer wavelengths rich in infra-red rays resulting in a heat built-up. Such glass houses are called greenhouses as the light and heat within such houses prove very effective for profuse growth of green plants although the outside is very cold and often snow-covered and barren.

The property of trapping heat by carbon dioxide and some other gases of the atmosphere is similar to the glass cover of a greenhouse that resists the escaping of heat radiated from inside the house. As such, these atmospheric gases are called the greenhouse gases that resist the escaping of radiated heat from the earth by absorbing infra-red rays and partially reflecting the trapped heat back to the earth's surface. This phenomenon is therefore called the greenhouse effect in which certain atmospheric gases act in a manner similar to the glass cover of a glass house (earth itself behaving as a greenhouse).

Statement 1 : Glass houses do not resist the escaping of infra-red rays

Statement 2 : Atmospheric carbon dioxide has similar property that of glass house

Statement 3 : The tropical flora is cultivated in glass houses at cold high altitude areas.

Ans. ○ ● ○
1 2 3

Passage-4

29. Oxides of sulphur, an important contributor to the problem of acid rain, are emitted primarily by power plants, smelters of zinc and copper ores and, to some extent, by chemical industries including sulphuric acid plants. Sulphur is present in coal as inorganic sulphur (mainly iron pyrites) and organic sulphur, bound to the coal matrix. The sulphur in coal is oxidized to SO_x during the combustion process. A significant part of the inorganic sulphur can be removed by washing or cleaning of coal (this is done in coal washeries) that makes it relatively free from non-carbonaceous matters before it is burnt. This, however, does not totally solve the problem. Technologies are now available to remove SO_x from the flue gases during combustion or at a later stage. Foremost among the available options is 'wet-scrubbing' of the flue gas using a slurry or suspension of powdered limestone. Oxides of sulphur, primarily sulphur dioxide (SO_2), react with limestone to form calcium sulphate (gypsum)

This is a proven technology and has been adopted by many power plants around the globe. The major drawback is the formation and disposal of a large amount of sludge of calcium sulphate ($CaSO_4$). An alternative effective technology is dry scrubbing of sulphur dioxide (SO_2) by directly injecting lime and limestone into the furnace. The oxides of sulphur are converted to calcium sulphate ($CaSO_4$) in situ and are discharged with the ash.

Statement 1 : Inorganic and organic sulphurs are both present within coal.

Statement 2 : Sulphur reduction by gypsum formation is not a widely used technology.

Statement 3 : Combustion of coal is not responsible for acid rain.

Ans. ● ○ ○
1 2 3

Passage–5

30. One of the main issues of the current phase of globalization has been the introduction of "Structural Adjustment Programmes" in the developing economies. Simultaneously with the introduction of the new policies, convergent studies point out that some human development indicators in the developing world are deteriorating. There is rising malnutrition, rising infant mortality rates, a rising proportion of high risk pregnancies, babies with very low birth weight, increased prevalence of disease, re-emergence in some countries of diseases previously thought to have been eradicated, and declining educational standards. The income gap between the rich and the poor countries is widening, and the gap between the richest of the poor and the poorest of the poor is also widening.

Women are the primary health providers and the primary educators. They try to meet the health needs of the families and mould the attitudes of their children. This is so in all the countries. But in developing countries there is less help available from social services than there is in the industrialized countries, which for the most part have national health and education programmes. When as a result of the adjustment policies, government and local health and education expenditures are reduced; the first victim is the poor woman.

Statement 1 : With globalization, structural adjustment programmes has also been initiated in developing countries.

Statement 2 : Women do not play an important role in improving health and education scenario of a country.

Statement 3 : When health and education expenditures are reduced, the first victim is the poor woman.

Ans.	●	○	●
	1	2	3

2018

Environmental Studies

Full Marks–75

(B. Com. Group)

Test Booklet Code—2

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25 = 25

1. **The instrument used to measure SPM in air is called**
   (a) High volume sampler (b) Hygrometer (c) Barometer
2. **The example of lotic water is**
   (a) Lake water (b) River flowing water (c) Seawater
3. **Activated sludge process is linked to**
   (a) Air treatment process. (b) Waste water treatment process.
   (c) Solid waste management.
4. **The most harmful UV-radiation is**
   (a) UV-A (b) UV-B (c) UV-C
5. **World Environment Day is celebrated on**
   (a) 22nd April (b) 5th July (c) 5th June
6. **If one species is found in a specific geographical location, it is called**
   (a) Endemic (b) Epidemic (c) Exotic
7. **Hazardous waste (Management & Handling) rules was notified in the year**
   (a) 1989 (b) 1986 (c) 1981
8. **With rise in every kilometre in the troposphere, the temperature decreases by**
   (a) 6·5°C (b) 6·6°C (c) 6·4°C
9. **One example of high cloud is**
   (a) Stratus cloud (b) Cirrus cloud (c) Altocumulus cloud
10. **Which one of the following is linked to 'Silicosis'?**
    (a) Heart (b) Lungs (c) Liver
11. **Ecotone is**
    (a) Ecosystem (b) Biome
    (c) Intermediate place between two ecosystems.

12. Western Ghats is famous as

(a) Ramsar site (b) Biodiversity hotspot (c) Lion conservation forest

13. Locust is a/an

(a) Insect (b) Bird (c) Fish

14. Daphnia is a

(a) Periphyton (b) Nekton (c) Plankton

15. Marsh gas is released from

(a) Wetland (b) Grassland (c) Tropical rainforest

16. 'Kerala Shastaa Sahitya Parishad (KSSP)' is linked with one of the following :

(a) Silent valley movement (b) Narmada Bachao Andolan (c) Chipko movement

17. The Water (Prevention & Control of Pollution) Cess Act was enacted in

(a) 1974 (b) 1977 (c) 1981

18. The example of in-situ conservation is

(a) Seed bank (b) Botanical Garden (c) National Park

19. Total number of biodiversity hotspots in the world is

(a) 25 (b) 35 (c) 17

20. The average temperature of the Earth is

(a) 10°C (b) 15°C (c) 20°C

21. Which one of the following is waterborne disease?

(a) Malaria (b) Filaria (c) Cholera

22. Bio diesel is prepared from

(a) Sugarcane (b) Jatropha (c) Wheat

23. Artesian well is related to

(a) Rain water (b) Ground water (c) Seawater

24. 'Blue baby syndrome' is caused by

(a) Phosphate (b) Arsenic (c) Nitrate

25. Genetic diversity is known as

(a) α-diversity (b) β-diversity (c) γ-diversity

ANSWERS

1.(a) High volume sampler; 2.(b) River flowing water; 3.(b) Waste water treatment process; 4.(b) UV-B; 5.(c) 5th June; 6.(a) Endemic; 7.(a) 1989; 8.(c) 6·4°C; 9.(b) Cirrus cloud; 10.(b) Lungs; 11.(c) Intermediate place between two ecosystems; 12.(b) Biodiversity hotspot; 13.(a) Insect; 14.(c) Plankton; 15.(a) Wetland; 16.(a) *Silent valley movement*; 17.(b) 1977; 18.(c) National Park; 19.(b) 35; 20.(b) 15°C; 21.(c) Cholera; 22.(b) Jatropha; 23.(b) Ground water; 24.(c) Nitrate; 25.(a) α-diversity.

Single/Multiple Answer-type Questions (Question Nos. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages 10×5 = 50

Passage-1

26. The term cyclone was given to a rotating storm in the tropics by Piddleton. The name cyclone has been derived from a Greek word'cyclo, which means the coil of a snake. These disturbances normally originate over warm tropical seas around a centre of low. This centre of low is usually formed in the months of May to September north of the equator ranging between 5°-10° N. Here the trade winds from both hemisphere converge at the equatorial low in summer months. This zone is called the Inter Tropical Convergence Zone (ITCZ). The position of ITCZ shifts and is related to the declination of the sun.

Statement 1 : The term cyclone was given by Piddleton.

Statement 2 : The centre of low pressure zone for formulation of cyclone is usually formed between 15°-20°N of equator.

Statement 3 : The 'cyclo' means coil of a snake.

Ans. ● ○ ●
1 2 3

Passage-2

27. In the autumn of 1952, the city of London remained covered with a thick envelope of fog continuously for five days. Many persons belonging to all the age-groups fell ill and around 4000 persons lost their lives due to that fatal fog. Later, it was revealed that the fog got admixed with poisonous gases containing mainly sulphur dioxide emitted from industries and motor vehicles. An English physician named the mixture of smoke and fog as smog (smog = smoke + fog).

This is not the single or earliest example of smog disaster. Similar event occurred in 1930 in the Mass river valley of Belgium and in 1948 in the city of Donora in the Pennsylvania State of the U.S.A., although the damaging effects were much less intense than that in the London smog disaster. The Los Angeles city of the U.S.A. and some cities of Japan are quite often covered with a black cloud of smog.

Statement 1 : In the year 1948, smog formed in the city of Donora in United States of America.

Statement 2 : In the year 1952, smog formed in the Mass river valley of Belgium.

Statement 3 : Smog is a mixture of smoke and fog.

Ans. ● ○ ●
1 2 3

Passage–3

28. Soils that form the veneer of the land surface is very important for biotic generation. Soils can hold water and help in the growth of plants, many microorganisms etc. Most plants get their nutrients from the soils for their sustenance. So soils are considered very important environmentally. Soils are formed due to weathering of rocks from the regolith and due to the interaction of climate, vegetation, topography etc. on it in the later stages. In soil we find three distinct horizons namely, A, B and C. The horizon A is the layer of leaching, B is the layer of deposition and C is the parent rock. The amount of leaching and deposition in a typical climatic and vegetative environment decide the characteristics of the soil including the fertility status.

Statement 1 : Three distinct horizons are found in Soil.

Statement 2 : The lowest layer of Soil Horizon is 'A' layer.

Statement 3 : Parent rock is found in 'C' horizon.

Ans. ● ○ ●
1 2 3

Passage–4

29. Nitrous oxide is produced through various natural processes, such as forest-fire, reaction in soil of a special type of bacteria, due to slow and spontaneous oxidation of crop residues or due to addition of nitrogenous fertilizers to the soil. This is also produced due to large-scale combustion of fossil fuels, particularly mineral oils used as a fuel in the large number of motor vehicles. The amount of this gas is increasing in the atmosphere at a rate of about 0·3 per cent per year. If the concentration goes on increasing at this rate it is apprehended that the amount of the gas in air would be 30-35 per cent higher than that present just before the industrial revolution. Its contribution to the greenhouse effect is about 4-5 per cent. From the point of view of trapping heat a molecule of nitrous oxide is 250 times more effective compared to a molecule of carbon dioxide.

Statement 1 : Nitrous oxide is produced due to forest-fire.

Statement 2 : The amount of nitrous oxide in atmosphere is increasing at the rate of 0·5 per cent each year.

Statement 3 : The contribution of N_2O to greenhouse effect is about 4-5 per cent.

Ans. ● ○ ●
1 2 3

Passage–5

30. Land constitutes less than one-third of the earth's surface (nearly 29%). But land's environment is crucial for human beings, as they live on land. Their sustenance depends on quality of the land. Most of the human occupations —say agriculture, mining, industry etc. are land specific. Even in the primitive society man depended solely on land resources in food gathering and hunting. With the progress of civilization and innovations of technologies man has affected the land — many forests have been cleared, many species have become extinct and much of the resources greatly depleted. Degradation of lands has become a crucial issue today in regard to sustenances of life on earth's surface.

Statement 1 : Land constitutes about 29% of earth's surface.

Statement 2 : Agriculture, mining and industrial works are land specific.

Statement 3 : Degradation of forests are not related to need of human being.

Ans. ● ● ○
1 2 3

Environmental Studies–2019

Full Marks–75

(B. Com. Honours Candidates)

Commerce Group

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25=25

1. **Which of the following is not a renewable resource?**
(A) Hydroelectric power (B) Petroleum (C) Plantation

2. **Which of the following leads to soil erosion?**
(A) Afforestation (B) Thermal power generation (C) Over grazing

3. **Sustainable development should be—**
(A) Individual centric (B) Anthropocentric (C) Ecocentric

4. **Which of the following plant types are characteristic flora of Sundarbans?**
(A) Xerophyte (B) Mesophyte (C) Halophyte

5. **Earth Day is celebrated on—**
(A) 5th June (B) 22nd April (C) 22nd May

6. **The gas responsible for Bhopal Gas Disaster is**
(A) DDT (B) MIC (C) CFC

7. **Chipko movement took place in**
(A) Kumayon region (B) Himachal region (C) Tehri-Garhwal region

8. **'Loktak' lake is located at**
(A) Assam (B) Mizoram (C) Manipur

9. **The 'Arabari Model' of West Bengal is famous for—**
(A) Joint Forest Management (B) Rain-water Harvesting (C) Solar power plant

10. **The origin of earth is best explained by**
(A) Big-Bang theory (B) Fragmentation theory
(C) Compaction and condensation theory

11. **The temperature in the surface of the Earth is a function of distance from the Sun, based on the surface temperature should have been -15°C, however the actual average surface temperature of Earth is 15°C. This 30°C warming of earth surface is caused by**
(A) heating contributed other stars (B) greenhouse warming
(C) thermal reaction in the Earth's interior

12. **Biosphere on the surface of the earth includes**
(A) only oceans (B) only continents
(C) a part of the atmosphere, hydrosphere and lithosphere representing existence of life

Oceanic and atmospheric circulations are set in the surface of the earth for
(A) equilibrating the thermal anomaly on earth surface
(B) convection current in the Earth's mantle (C) continental drift

Noamundi mines are famous for
(A) Gold ore (B) Iron ore (C) Copper ore

The third generation resource for biofuel production is
(A) corn (B) grass species (C) algae

Which one of the following is a secondary air pollutant?
(A) PAN (B) CO (C) SO_2

Cadmium pollution results in which of the following disease?
(A) Itai-Itai (B) Dyslexia (C) Minamata

Demography is the study of understanding
(A) Human ecology (B) Human population (C) Biogeography

Which of the following is also known as 'Umbrella Act' of Env.?
(A) Environment Protection Act (B) Air Pollution related Act
(C) Water Pollution related Act

Which of the following is not the source of anthropogenic air pollution?
(A) Thermal power plant (B) Forest fire (C) Incineration

21. **Which of the following statement is not true regarding 'Organophosphorous insectisides'?**
(A) They are persistant organic compounds
(B) Prevents Acetylcholinesterase enzyme to release
(C) DDT is an example of organophosphorous compound

22. **Which of the following does not fall under 'in situ conservation'?**
(A) Seed Bank (B) National Park (C) Sanctuary

23. **The free floating microscopic organisms are known as**
(A) Nekton (B) Benthos (C) Plankton

24. **CBD stands for**
(A) Conference on Biodiversity (B) Convention on Biodiversity
(C) Climate and Biodiversity

25. **Keoladeo National Park is located in**
(A) Assam (B) Gujarat (C) Rajasthan

ANSWERS

1.(B) Petroleum; 2.(C) Over grazing; 3.(C) Ecocentric; 4.(C) Halophyte; 5.(B) 22nd April; 6.(B) MIC; 7.(C) Tehri-Garhwal region; 8.(C) Manipur; 9.(A) Joint Forest Management; 10.(A) Big-Bang theory; 11.(B) greenhouse warming; 12.(C) a part of the atmosphere, hydrosphere and lithosphere representing existence of life; 13.(A) equilibrating the thermal anomaly on earth surface; 14.(B) Iron ore; 15.(C) algae; 16.(A) PAN; 17.(A) Itai-Itai; 18.(B) Human population; 19.(A) Environment Protection Act; 20.(B) Forest fire; 21.(C) DDT is an example of organophosphorous compound; 22.(A) Seed Bank; 23.(C) Plankton; 24.(B) Convention on Biodiversity; 25.(C) Rajasthan.

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages **10×5=50**

Passage–1

26. Due to their low temperatures, the Arctic, Antarctic and Tibetan Plateau are known as the three polar regions of the Earth. As the most remote regions of the glob, the occurrence of persistent organic pollutants (POPs) in these polar regions arouses global concern. Overall, concentrations of POPs in the environment (air, water, soil and biota) have been extensively reported, with higher levels of dichloro-diphenyl-trichloro-ethane (DDT) and hexachloro-cyclohexane (HCH) detected in the polar regions. The spatial distribution of POPs in air, water and soil in the three polar regions broadly reflects their distances away from source regions. Based on long-term data, decreasing trends have' been observed for most "legacy POPs". Observations of transport processes of POPs among multiple media have also been carried out, including air-water gas exchange, air-soil gas exchange, emissions from melting glaciers bioaccumulations along food chains, and exposure risks. The impact of climate change on these processes possibly enhances the re-emission processes of POPs out of water, soil and glaciers, and reduces the bioaccumulation of POPs in food chains. Global POPs transport model have shown the Arctic receives a relatively small fraction of legacy POPs, but that climate change will likely increase the total mass of all compounds in this polar region.

Statement 1 : Worldwide transportation of POPs occur through air, water, soil and biota following a cyclical manner.

Statement 2 : Tibetan *Plateau* remains unpolluted by DDT, HCH and other POPs.

Statement 3 : Both global climate change and air transportation are the major cause of accumulation of POPs in polar regions.

Ans. ● ○ ●
1 2 3

Passage–2

27. Cadmium is a toxic heavy metal that has been increasingly regulated over the past few decades. The main exposure routes for the general public are the consumption of certain foods and the inhalation of cigarette smoke. However, additional exposure may occur through the current and historical use of the metal in consumer products. Measurements of Cd in historical and contemporary products ascertained by X-ray fluorescence (XRF) are reported. Cadmium is encountered across a wide range of contemporary plastic products, mainly because of the unregulated recycling of electronic waste and polyvinyl chloride. However, concentrations are generally low (<100g fig''), conforming with current limits and posing minimal risk to consumers. Of greater concern is high concentrations of pigmented Cd (up to 2% by weight) in old products, and in particular children's toys. The principal current use of Cd pigments is in ceramic products where the metal is encapsulated and over glazed. The greatest consumer risk identified is the use of Cd pigments in the enamels of decorated drinking glasses. Thus, while decor is not restricted to the exterior, any enamel within the lip area is subject to ready attack from acidic beverages because the pigments are neither encapsulated nor over glazed. Glass bottles decorated with Cd-based enamel do not appear to represent a direct health hazard but have the propensity to contaminate recycled glass products.

Statement 1 : Cadmium concentration can be measured through a technique called XRF.

Statement 2 : Inhalation of tobacco is one of the important source of cadmium toxicity.

Statement 3 : High concentrations of pigmented Cd is found either in the toys or the inner portion of decorated glass items do not pose any health risk to the consumers and thus is safe to use.

Ans. ● ○ ●
1 2 3

Passage–3

28. The fixation of inorganic carbon species like CO_2 to more reduced organic forms is one of the most fundamental processes of life. Although several carbon fixation pathways are known to exist, on Earth today nearly all global carbon fixation is driven by the Calvin cycle in oxygenic photosynthetic plants, algae, and Cyanobacteria. At other times in Earth history, other organisms utilizing different carbon fixation pathways may have played relatively larger roles. With this balance shifting over geological time as the environmental context of life has changed and evolutionary innovations have accumulated. Among the most dramatic changes that our planet and the biosphere have undergone are those surrounding the rise of O_2 in our atmosphere during the Great Oxygenation Event at ~2.3 Ga, and perhaps again during Neoproterozoic or Paleozoic time. These oxygenation events likely represent major step changes in the tempo and mode of biological productivity as a result of the increased productivity of oxygenic photosynthesis and the introduction of O_2 into geochemical and biological systems, and likely involved shifts in the relative contribution of different carbon fixation pathways.

Statement 1 : Calvin cycle drives global carbon fixation.

Statement 2 : Cyanobacteria can fix CO_2 through photosynthesis.

Statement 3 : CO_2 is an organic carbon species.

Ans. ● ● ○
1 2 3

Passage–4

29. During the past few decades people in various regions of India have formed nonviolent action movements to protect their environment, their livelihood, and their ways of life. These environmental movements have emerged from the Himalayan regions of Uttar Pradesh to the tropical forests of Kerala and from Gujarat to Tripura in response to projects that threaten to dislocate people and to affect their basic human rights to land, water, and ecological stability of life-support systems. They share certain features, such as democratic values and decentralized decision making, with social movements operating in India. Similar grassroots environmental movements are emerging in Japan, Malaysia, the Philippines, Indonesia, and Thailand. Throughout Asia and the Pacific citizenry organizations are working in innovative ways to reclaim their environment.

Among the main environmental movements are Chipko Andolan and Save the Bhagirathi and Stop Tehri project committee in the then U.P.; Save the Narmada Movement (Narmada Bachao Andolan) in Madhya Pradesh and Gujarat; youth organizations and tribal people in the Gandhamardan Hills whose survival is directly threatened by development of bauxite deposits; the opposition to the Baliapal and Bhograi test range in Orissa, the Appiko Movement in the Western Ghats; groups opposing the Kaiga nuclear power plant in Karnataka; the campaign against the Silent Valley project; the Rural Women's Advancement Society (Gramin Mahila Shramik Unnayan Samiti), formed to reclaim wasteland in Bankura district; and the opposition to the Gumti Dam in Tripura.

Statement 1 : The Appiko Movement, adopted by rural people was formed both in the Eastern and Western Ghats.

Statement 2 : 'Gumti Dam' is located in North East India.

Statement 3 : The main objectives of the grassroots level movements, either Nationally or Internationally, is to ascertain the basic human rights to land, water, and ecological stability of life support systems.

Ans. ○ ● ●
1 2 3

Passage–5

30. Globally, humans are now the dominant factor which can influence on biodiversity. Furthermore, the main force driving the global transformation of the biosphere is human population growth, together with increasing resource consumption and socio-cultural change. Inevitably, this raises the question of carrying capacity of the planet and whether we can continue to increase our demands on it without limits or not. Strictly speaking, no part of the world is considered truly undisturbed by human.

Conservation biology is the study and practice of evaluating the status of extant organisms and developing techniques to manage their populations for future sustainability, including methods to bring endangered organisms back from the threat of extinction. It is a new stage in the application of science to conservation problems, addresses the biology of species, communities, and ecosystems that are perturbed, either directly or indirectly, by human activities or other agents. Its goal is to provide principles and tools for preserving biological diversity. Therefore, three overriding principles guide conservation biology. First, evolution is the basis for understanding all of biology, and should be a central focus of conservation action. Second, ecological systems are dynamic and non-equilibrial, and therefore change must be a part of conservation. Finally, humans are a part of the natural world and must be included in conservation concerns.

Statement 1 : To understand biology in a holistic way, knowledge in evolution is the most fundamental and important basis.

Statement 2 : Most of the geographical locations in the world are anthropogenically disturbed.

Statement 3 : Ecological systems are equilibrial and non-dynamic.

Ans. ● ● ○
1 2 3

2019

Environmental Studies

(Science / Arts / Music Group)

Full Marks–75

Please carefully read the instruction given in the answer sheet

Candidates are required to give their answers in their own words as far as practicable

The figures in the margin indicate full marks

Single answer type Questions (1 to 25)

Mark in the answer sheet to the right answer of all the following questions. (1 to 25) 1×25

1. **Free floating aquatic microscopic organism are known as —**
(A) Nekton (B) Plankton (C) Periphyton

2. **Activated sludge is associated with**
(A) air purification process (B) waste water treatment (C) solid waste management

3. **Fly ash is'produced by**
(A) Hydro-electric project (B) Thermal power plant (C) Incinerator

4. **Ring of fire is located in**
(A) The Pacific Ocean (B) The Atlantic Ocean (C) The Arctic Ocean

5. **Example of lotic water is**
(A) Still water of lake (B) Running water (C) Tidal water in estuary

6. **Sand fly is responsible for**
(A) Plague (B) Leprosy (C) Kala-azar

7. **The scale that measure the magnitude of earthquake is**
(A) Kelvin's Scale (B) Fahrenheit Scale (C) Richter Scale

8. **Bharat Stage-VI is related to**
(A) Thermal power plant emission (B) Industrial emission
(C) Automobile emission

9. **The book 'The Great Derangement' is written by**
(A) Sunil Gangopadhyay (B) Mahasweta Devi (C) Amitav Ghosh

10. **Dengue is transmitted by**
(A) Female *Anopheles* (B) Female *Culex* (C) Female *Aedes*

11. ***Salmonella* sp. and *Shigella* sp. are pathogens that transmit through**
(A) Air (B) Water (C) Vector

12. **Sundarbans are abundant in having**
(A) Xerophytes (B) Mesophyte (C) Mangrove

13. **'Joint Forest Management' was initiated in India at**
(A) Chattisgarh (B) Uttaranchal (C) West Bengal

14. **Loktak Lake, one of the most vulnurable wetlands in India is situated in**
(A) Manipur (B) Tripura (C) Meghalaya

15. **'*Jatropa*', a plant is connected to**
(A) Biomass fuel (B) Biodiesel (C) Natural gas

16. **Which one of the following does not contain biomass?**
(A) Sewage (B) Wood (C) Metal

17. **The address of an organism is its**
(A) Niche (B) Habitat (C) Home range

18. **The speed of wind is measured by**
(A) Anemometer (B) Hygrometer (C) Seismograph

19. **Confinement of species in a particular area is described as**
(A) Endemic (B) Epidemic (C) Exotic

20. **Genetic diversity is also referred to as**
(A) α-diversity (B) β-diversity (C) γ-diversity

21. **Biomes are recognised by their types of**
(A) Dominant vegetation (B) Dominant Wildlife (C) Dominant Population

22. **Rachel Carson wrote the following book**
(A) Silent Spring (B) The Fall of Sparrow (C) Human Zoo

23. **pH value of water is 5, when it is**
(A) Acidic (B) Alkaline (C) Neutral

24. **Which one is not an airborne disease?**
(A) Tuberculosis (B) Chicken pox (C) Cholera

25. **Artesian well is related to–**
(A) Rain water (B) Ground water (C) Watershed.

ANSWERS

1.(B) Plankton ; 2.(B) waste water treatment; 3.(B) Thermal power plant; 4.(A) The Pacific Ocean ; 5.(B) Running water; 6.(C) Kala-azar; 7.(C) Richter Scale; 8.(C) Automobile emission; 9.(C) Amitav Ghosh; 10.(C) Female *Aedes*; 11.(B) Water; 12.(C) Mangrove; 13.(C) West Bengal; 14.(A) Manipur ; 15.(B) Biodiesel; 16.(C) Metal; 17.(A) Niche; 18.(A) Anemometer; 19.(A) Endemic; 20.(A) α-diversity; 21.(A) Dominant vegetation; 22.(A) Silent Spring ; 23.(A) Acidic; 24.(C) Cholera; 25.(B) Ground water.

Single/Multiple Answer-type Questions (Question No. 26 to 30)

Read the following passages carefully and darken the circle/circles corresponding to the correct statement/statements of the respective passages 10×8

Passage–1

26. Organic substances in water, particularly waste water of industrial or municipal origin, are utilized as food by the microorganisms present in water for survival as well as for growth. Such organics are called biodegradable and include materials like starch, fats, proteins, alcohols, aldehydes, esters, etc., and may sometimes be the decomposition products of animal or plant origin. Microbial degradation of these materials may occur through oxidation (aerobic) or through reduction (anaerobic). In the former process, carbon dioxide (CO_2) and water (H_2O) are the end products, while the latter process yields a spectrum of products containing hydrocarbons, carbon dioxide, ammonia, hydrogen sulphide etc.

The most important effect of aerobic biodegradation of organics is lowering of dissolved oxygen level in water. Metabolism of organics by bacteria requires oxygen that comes directly from water. The dissolved oxygen concentration in water decreases as a result. The more is the concentration of biodegradable organics in water, the less will be the concentration of dissolved oxygen in it. The amount of biodegradable organics present in water is not measured directly. It is rather measured in terms of the requirement of oxygen of the microbial degradation process which is called 'Biochemical Oxygen Demand' or BOD, and is expressed as milligram of oxygen consumed for the degradation of the organics present in one litre water.

Statement 1 : Organic substances present in the municipal waste water are not biodegradable.

Statement 2 : The amount of BOD in water is expressed as milligram of oxygen consumed for degradation of organics present in one litre of water.

Statement 3 : The end product of organics decomposition by aerobic means are carbon dioxide and water.

Ans.	○	●	●
	1	2	3

Passage–2

27. Everyone of us requires a finite area of Earth's surface to support our existence. This is our 'Ecological Footprint'. Its principal components are, our food footprint, our wood products footprint, and our degraded land footprint. If I eat potatoes, in the course of a year, I consume a measurable quantity of potatoes. There is thus an area of potato production somewhere in the world that is dedicated solely to me for my annual consumption of potatoes. Same is true for other food products. That's my food footprint. This footprint has no definite measurement. I can change this measurement by changing my food habits.

Statement 1 : The surface area required to stand on foot is called ecological footprint.

Statement 2 : Ecological footprint depends on the consumption of each and every individuals.

Statement 3 : Ecological footprint is the finite area on Earth's surface to support everyone's existence on the Earth.

Ans.	○	●	●
	1	2	3

Passage–3

28. An ecotone is a transition area between two adjacent ecological communities (ecosystems). It may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line. Changes in the physical environment may produce a sharp boundary, as in the example of a shoreline or the interface between areas of forest and cleared land. Elsewhere, a more gradually blended interface area will be found, where species from each community will be found together as well as unique local species. Mountain ranges often create such ecotones, due to the wide variety of climatic conditions experienced on their slopes.

Statement 1 : An ecotone is a transitional area between two adjacent ecological communities.

Statement 2 : An ecotone always produce a sharp boundary.

Statement 3 : An ecotone may appear on the ground as gradual blending of two communities across a broad area.

Ans.	●	○	●
	1	2	3

Passage–4

29. Large-scale industry has been with us for just about two hundred years. By its
ecological impact has been profound, far surpassing all that preceded this revoluti The
main reason for this is the enormous jump in the use of energy with heavy dema on non-
renewable resources (e.g. coal and oil), supplemented by the use of entirely sources
such as nuclear energy. In the industrial mode energy use follows an ive path in
which natural resources are both harnessed (e.g. hydropower) and min g., fossil fuels)

for human consumption. This mode has also brought about the use of a whole new range of man-made materials, e.g., metals, plastics, silicon chips and synthetic pesticides. With great improvements in transportation within the industrial mode it has been possible to transport even bulky, heavy goods like timber and rock with ease over large distances.

Statement 1 : One of the main features of modern industrialisation is its dependence on non-renewable resources of energy.

Statement 2 : Industrial revolution initiates the development of many materials that are previously unavailable.

Statement 3 : Large scale industry was originated in the last one hundred year.

Ans. ● ● ○
1 2 3

Passage–5

30. When man's immediate ancestor first appeared on the surface of earth about 2 million years ago, the world was biologically rich in millions of other species including plants, animals, fungi, and microorganisms. The biological richness of the earth remained part of the habitat and shaped the destiny of man. Even today our existence is closely related to it, as the biosphere constitutes an essential life-support system to us.

Diversity of life is expressed in terms of biological diversity, which is the total variety of life-forms on the earth's surface. It refers to the sum total of varieties of species-microbes, plants, insects, amphibians, reptiles, birds and mammals found in the biosphere and associated with the ecosystem. Biological diversity is studied at three different levels : (a) Diversity of biotic communities within an ecosystem, (b) Diversity of species within a community, and (c) Diversity of genetic organisation within a species.

Statement 1 : The human being first originated in the earth about 15 lakhs years ago.

Statement 2 : Estimate of biodiversity includes the measurement of Ecological diversity.

Statement 3 : Conservation of biodiversity is intricately connected with the survival of mankind.

Ans. ○ ● ●
1 2 3